The Chemical Age

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Notes and Comments

Cheerful Holiday Reading

OFFICIAL statistics do not in the ordinary way commend themselves as holiday literature, but there are aspects of the monthly returns issued by the Board of Trade in respect of Britain's overseas trade in July which make them attractive even to those who are enjoying a well earned respite. Total exports were over 8 per cent. greater than in July, 1934, and total imports were 6 per cent. higher. For the seven months to the end of July the increase in exports was $7\frac{1}{2}$ per cent., and the increase in imports was in the neighbourhood of 0.15 per cent. The chemical industry's contribution to the total trade of the country was no less satisfactory. For the month of July the exports of chemicals, drugs, dyes and colours amounted to £1,715,252, showing an increase of over 10 per cent. compared with July, 1934. July's exports brought the total for the year to date to £11,754,579, showing a rise of well over 4 per cent. over the corresponding figures for the first seven months of last year. Turning to imports we find that chemicals, drugs, dyes and cloours brought into Great Britain last month amounted to £920,896, or about $1\frac{1}{4}$ per cent. higher than a year ago, while the seven months' total of £6,372,245 was something over $2\frac{1}{2}$ per cent. lower than for the same period in 1934.

While the figures necessarily fluctuate over a considerable range from month to month, it is clear that the chemical industry is steadily improving its balance of exports over imports. The details extracted from the returns and reproduced in other pages of this issue show the trend of the various classes of products included under the general heading of chemicals, drugs, dyes and colours, and indicate those directions in which the industry would do well to concentrate upon the home production of chemicals in order to stem the tide of competitive imports.

A Problem for Chemists

IT is surprising how seldom most chemists have even nodding acquaintance with the problems of other industries. A few minutes self-questioning would reveal to most of our senior readers that whilst they could point to a number of problems in their own industry that would repay investigation, they are completely ignorant of the problems of other chemical industries. The case of the junior chemist is yet worse, for in general he does not know even the problems of his own industry. Perhaps it matters little whether he knows them or not, for in most instances the solution of them seems far beyond his powers. To say that the problems should, therefore, not be disclosed, however, is a short-sighted view because there have been occasions when the experts have been worsted by a problem that has been solved by the amateur; in many instances this is just another aspect of the curious workings of the human brain. Is not the moral that industry does not advertise its problem sufficiently? It would be all to the good if a list of the problems that affect whole industries could be set down for the attention of all who are sufficiently interested to work upon them. There are private research departments, research associations and national research institutions, but there remains a further untapped source of progress in numerous private investigators and teaching institutions who would welcome some guide as to problems in which their assistance might be of value. An important qualification is attached to these investigators, namely, that for the most part they cannot undertake work other than that suited to the laboratory bench.

A problem of this nature has arisen in the tar and coal carbonisation industries. The importance of motor benzol is well known to chemists, but the importance of freedom from sulphur and its concomitants, bad odour and colour, are less well known. The sulphur compounds in benzol are, in order of importance, carbon disulphide, thiophene and mercaptans. Thiophene and mercaptans are removed by washing with strong sulphuric acid and alkali, but of late other processes have come into use which avoid the loss of unsaturated hydrocarbons consequent upon the strong acid wash. The inhibitor process—the addition of small amounts of tar acids to the bezol to prevent the formation of gums—removes the necessity for acid washing to remove gum-forming substances, but does not affect the sulphur content. If a sufficiently strong and prolonged and wash is not given, the thiophene remains in the benzol and it is necessary to remove the carbon disulphide to a greater extent than heretofore.

Two New Methods

FOR some time past the only way of removing carbon disulphide from motor benzol has been by distillation, but of late two methods have been put into commercial application by which the CS_2 has been removed by chemical means. One of these has been patented by the Yorkshire Tar Distillers and consists of the treatment either of benzol or of benzol forerunnings with an aqueous solution of ammonia, ammonium disulphide and preferably also ammonium monosulphide. The carbon disulphide appears to be principally converted into ammonium thiocyante, but no details of the process have been published beyond the patent. The other process, devised by the chemists of the National

Benzol Co., has as its basis the well-known xanthate reaction resulting from the contact of alcoholic soda and carbon disulphide. For many reasons it has been found preferable to use methyl alcohol instead of ethyl alcohol. A full description of this process has recently been published by the inventors in the Transactions of the Society of Chemical Industry. It will be immediately clear that all these complicated processes necessitated by the more drastic removal of carbon disulphide now practised add to the expense of manufacturing motor benzol.

To these circumstances, there is about to be added another, namely, that the gas industry, which is recovering benzol to a greater extent than ever before, is finding it desirable to remove all the sulphur from its gas. There is only one method known by which the total sulphur content of coal gas can be reduced below 10 grains per 100 cu. ft. of gas, and that is to follow the usual sulphuretted hydrogen removal plant by an active carbon plant for the removal of benzol. Whilst it is not essential to remove all the benzol at the same time as the sulphur compounds—the oil-washing benzol plant could be placed in front of a sulphur-removing active carbon plant—naturally most works would prefer to combine the two. The result can only be that the benzol would contain far more sulphur than it does to-day, and the cost of purification must be increased yet more. The active carbon process only removes the total sulphur down to about 6 grains per 100 cu. ft. and for many purposes it is desirable to get to yet lower limits, say, 1 grain. The problem can be stated thus: To discover a method whereby the carbon disulphide and thiophene together with the mercaptans (these may be primarily formed on storage of the benzol and may not exist in the gas as such) are completely removed from coal gas without affecting the benzol. The sulphur-free gas would then pass to the benzol recovery plant. There must be many similar chemical problems worrying different industries to-day, perhaps not confined to the strictly chemical industry.

Purity of Foodstuffs

MR. H. H. BAGNALL has recently issued his annual report as City Analyst of Birmingham, in the course of which he makes some interesting observations on the report submitted to the Ministry of Health last year by the departmental committee appointed to inquire into the working of the law as to the composition and description of articles of food other than milk. During the inquiry memoranda were submitted by 66 organisations and private persons and oral evidence was heard from over 70 persons representing a wide range of interest and opinion. A large measure of agreement was found to exist in support of the view that alteration of the law was necessary although there was considerable divergence of opinion as to the precise changes necessary or desirable. It now seems possible, says Mr. Bagnall, to look forward with some degree of confidence to the time when consumers will know what to expect in reply to a demand for a particular article and a measure to carry into effect the recommendations of the committee will, it is to be hoped, be not long delayed. If at the same time it could be found convenient to consolidate all the statutes dealing with the composition of food, public analysts should have an up-to-date and efficient instrument in their hands which should ensure that the quality and composition of food sold in this country corresponds with the claims made for it by manufacturers and with the expectations of the buyer.

It is, however, rather to be regretted that the committee could not see its way to adopt the recommendations of several important bodies to the effect that a small permanent committee consisting of representatives of the Ministry of Health, of associations of local authorities, analysts and medical officers with the temporary co-operation of manufacturers and other interested parties, should be set up to consider and formulate standards instead of leaving this duty to the Minister of Health. The formulation of standards will probably be a difficult and complex problem and each food will need special detailed expert consideration. If it were found necessary, small sub-committees could be set up by such a committee with power to co-opt experts and others competent to deal with particular problems. It may yet be found that this is the most convenient and most satisfactory method of settling this very fundamental problem.

Accidents to Young Persons

IN his report for the year 1934, recently reviewed in THE CHEMICAL AGE, the Chief Inspector of Factories is gravely concerned with the large number of accidents which occur to those who are known legally in industry as young persons. A great number of these accidents, it appears, are suffered by young people who are given work on machines, for which work, apparently, they are not properly trained. This is a state of affairs which, we are happy to learn from the Imperial Chemical Industries' Magazine, does not exist in I.C.I. Such accidents as do happen to younger employees are, so far as we can see from the official returns, most frequently the result of taking unnecessary (and, in some cases, completely foolhardy) risks, disobedience of orders, or ordinary high spirits leading to horseplay. Whatever the reason for individual accidents, the main point for all interested in safety is that the younger employees are probably more likely to involve themselves in an accident than their elders.

It may be said with a certain amount of truth that youths and apprentices will quickly learn the painful consequences of unsafe practices, but these Spartan principles are not really worthy of a progressive concern. There is an easily visible line between " wet-nursing " and the common-sense essentials of safety instruction where young employees are concerned. In I.C.I. plants and in many other well conducted concerns where youths are employed, the safety aspect invariably receives special consideration by the management. It is up to everybody to do what they can to ensure that the lads take proper advantage of the good conditions under which they work. Other employees who have youths working with them can do a lot in a quiet way to start the lads in the right way.

THE Italian production of sulphuric acid in 1934 totalled 1,238,700 metric tons in terms of 50° Be acid, as compared with 1,127,475 tons in 1933 and 849,667 in 1932. The three most important producers of nitric acid by direct synthesis and oxidation of ammonia, *i.e.*, Montecatini, Terni and Azogeno, report expansions in their plants, with a resulting increase in production of nitric acid to 207,660 tons in 1934, nearly 30,000 tons more than in 1933 and nearly double the 1932 figure. Production estimates of hydrochloric acid are not available.

Chemical Aspects of Food Preservation

Points from the Annual Report of the Food Investigation Board

THE work at the Torry Research Station on the chemical constituents of the fats of fish and related substances is a good illustration of the dual character of investigations carried out by the Food Investigation Board, states the Annual Report of the Board for the year 1934 (H.M. Stationery Office, 4s. net). The fats from aquatic species, animal and vegetable, are unusually complex, and it is only recently that detailed data for this important group have begun to appear in any quantity.

Many points of scientific value are associated with this work, apart from as precise a definition as possible of the kinds and quantities of the different fatty acids present as glycerides in the fats from aquatic sources. For instance, now that detailed knowledge of the components of the oils of the liver and flesh of a fairly wide range of common fish has been obtained (in the course of which a distinct difference in components was observed as between the fats of marine and of fresh-water fish), more systematic studies have been begun on the following broad lines. First, the fats of the more minute fauna and flora, both marine and fresh-water, which serve as food for the larger fish, are being examined. Secondly, investigations have been begun on the fats of different parts of the larger fish and marine mammals, on the fats of one species of fish at different periods of its life-cycle, and on a number of similar problems. A large field of research is thus developing, the results of which are bound to lead to a more thorough insight into the processes by which fish lay down their specific kinds of fats.

Refrigeration in the Herring Industry

Important developments have taken place during the year in the application of refrigeration to the herring industry. The herring differs in important respects from white fish; for instance, in the far higher proportion of fat which it contains. It was consequently rather surprising, and at the same time encouraging, to find that there was little corresponding difference in its behaviour during brine-freezing and cold storage. Experiments at the Torry Research Station showed that herring could be brine-frozen at the usual temperature of −5° F., and would make good kippers (a drastic test of quality) after at least five months' storage at that temperature.

The influence on the relative humidity in cold stores of the heat produced by the stored material has already been analysed theoretically, and the results shown to conform with practical experience. The heat which leaks in from the external environment exerts a similar effect, and a jacketed construction has accordingly been proposed for cold stores in which it is desired to maintain high relative humidities. Recently, in the light of three years' investigations in the experimental hold at the Ditton Laboratory, and of the increasing accuracy with which it is possible to define the biological requirements of stored foodstuffs, a new method of cooling ships' holds has been suggested that seems, *prima facie*, suitable for a wide range of cargoes, such as is carried in ships trading from Australia and New Zealand, and which offers certain economies in space and equipment. A two-stage system of air-circulation is proposed, the air-stream passing vertically downward through the cargo, and then returning to the cooler by way of a jacket, lining the sides, in which the heat of leakage is removed.

Leakage of Heat from Insulated Vessels

The elaboration of these proposals was made possible by the more accurate information which is now available as to the rate at which heat leaks through the various walls of an insulated vessel. From the thermal standpoint these walls are so complicated in structure that it has been necessary to supplement mathematical analysis by large-scale measurement. The preponderating effect of frames and beams in increasing the leakage of heat suggested the practicability of recessing the insulation between these structures in order to provide for the jacket referred to in the last paragraph. This possibility has been explored by experiments in which the method of electrical resistance was used, and the results have been checked at critical points by thermal measurements on a half-scale model. The general conclusion reached is that widespread employment of recessed insulation will only be justified if it is practicable to make some compensation in the insulation on the face of the frame.

In considering the palatability of meat, account must be taken of the amount of extra-cellular protein (*i.e.*, the protein of the connective tissue), of the extent of denaturation and of the capacity of the native and denatured proteins of muscle to hold water. Satisfactory methods have been evolved for determining the amounts of the individual proteins in muscle. This is the first attempt to make so complete an analysis, and the methods devised now permit of such changes as denaturation in stored meat being followed with some certainty. The fact that there is no appreciable denaturation during *rigor* has been confirmed.

State of Water in Protein Systems

The state of the water in protein systems, including egg-albumin and muscle, has been determined by the method based on the water content of the protein in equilibrium at a given pressure. The results confirm the fact previously established with gelatin, that there is a definite fraction of the water which can be regarded as chemically bound to the protein; in the case of egg-albumin it is approximately 0.24 grams per gram of dry protein. The amount of chemically-bound water in native and denatured egg-albumin appears to be the same, but the loosely-held or oriented water is less in the denatured protein. The bound water of egg-albumin and hæmoglobin at temperatures of 0° and 20° C. has been determined by measuring the solubility of sodium and potassium chlorides in concentrated solutions of these proteins.

The oxidation of hæmoglobin to methæmoglobin is of importance in the carriage of meat, fish and other animal products in air and in air enriched with carbon dioxide, since the formation of methæmoglobin is largely responsible for loss of bloom. The reaction has been studied at different pressures of oxygen at a temperature of 30° C.; it is monomolecular with respect to the concentration of reduced hæmoglobin, and roughly monomolecular with respect to the partial pressure of oxygen. The rate of reaction is maximal at a partial pressure of 23 mm. of carbon dioxide (approximately). The results confirm the conclusion previously reached, that the presence of carbon dioxide in concentrations not exceeding 10 per cent. has a negligible effect; they also show that where 10 per cent. of carbon dioxide is present, the concentration of oxygen must be increased to more than 60 per cent. if the production of methæmoglobin is to be appreciably retarded.

The investigation of the germicidal effects of ozone on bacteria has continued. Ozone is germicidal to bacteria in concentrations of the order of 100-1,000 parts per million. The critical concentration depends upon the organism, the temperature, the age of the culture and the nature of the medium. A study of the mortality of bacteria, rapidly frozen in solid carbon dioxide and stored at various temperatures between 0° and −20° C., has shown that the rate of mortality is greatest in the region 0° to −5° C. It is probable that there is a correlation between this and the various events in frozen muscle, including denaturation, all of which are maximal in the range −2° to −3° C.

Changes in Stored Eggs

A preliminary study has been made of the changes which take place when eggs are stored in air and in air enriched with carbon dioxide. The hydrogen-ion concentration of the white at laying is *p*H 7.9, and subsequently rises to 9.5, owing to loss of carbon dioxide. To maintain the white at *p*H 7.9, eggs must be stored in atmospheres containing approximately 10 per cent. of carbon dioxide at a temperature of 20° C. and 3 per cent. at a temperature of 0° C. Other points of interest are as follows. Eggs stored at a temperature of 0° C. in atmospheres containing 5 per cent. or more of carbon dioxide, show a marked diminution in the amount of thick or viscous white, and in the viscosity of the thin or fluid white. A

hydrostatic method gives the bursting strength of the intact yolk-membrane of the new-laid egg as approximately 4,500 dynes/cm. The yolks of freshly laid eggs from the same source show wide variations in bacterial content, while the whites of all the eggs examined have been sterile. The oxidative and hydrolytic changes in the fat of egg-yolk during storage over a period of six months at a temperature of 0° C. appear to be insignificant.

Fruit and Vegetables

Further results of interest have emerged from the continued study of the critical changes that occur at the climacteric in the apple. The most important is perhaps the identification of the active substance which is given off by apples at their climacteric change, and which itself stimulates this change in other apples. This substance has been identified by absorbing it in bromine at a temperature of −65° C., and subsequently preparing a crystalline derivative identified as diphenyl-ethylene-diamine. The previous suggestion that the active substance was, in fact, ethylene, a suggestion based on analogies between the effects of the active substance and the effects of ethylene on fruits and seeds, is therefore confirmed. The ethylene constitutes only an extremely small fraction of the gaseous substances as a whole given off by apples. It seems to be of the order of one cubic centimetre during the whole of an apple's senescence.

It has been confirmed that the amount of volatile substances produced by apples, as determined by combustion, rises with the climacteric rise in respiratory activity, and that artificial stimulation of the climacteric with ethylene, prior to the time of its normal occurrence, causes a similar increase in the evolution of volatile substances. Periodic analyses of the sugars in apples prior to and during the climacteric change, indicate that one of the critical changes occurring at the climacteric is that fructose, which previously has not been utilised in the metabolism of the cell, begins to be drawn upon as the substrate for respiration.

The chemical background of the physiological disease known as low-temperature breakdown has been strengthened by the discovery that the amino-acids reach a maximal concentration in the tissues prior to its development. This maximum is due, not to the hydrolysis of protein, but to a change in the relative proportions of the components of that fraction of the nitrogenous constituents which is soluble in alcohol.

Gas Storage of Apples

The development of gas storage for fruit goes on apace. During the year the number of commercial gas stores in this country has increased from 12 to 40, and it is understood that the number is likely to be doubled in the course of the next twelve months. At present, however, no means are provided for adjusting the concentrations of oxygen and carbon dioxide other than regulated ventilation: it is therefore impossible as yet to employ atmospheres in which the proportions of both these gases are low, such as many varieties of apples require.

The trials of English varieties of apples in gas storage have now shown that many of them are best stored in an atmosphere containing five per cent. of carbon dioxide and two and a half to five per cent. of oxygen. For reasons which are not yet clear, a few varieties will tolerate a higher concentration of carbon dioxide and give the best results when eight to ten per cent. is present. On the other hand, there are a few varieties for which even five per cent. of carbon dioxide is excessive.

Pork, Bacon and Ham

One of the difficulties confronting the bacon and ham curer is lack of uniformity in his supplies of pigs, due chiefly to the widely different methods of feeding and management employed. An investigation of the factors affecting the quality of the carcass has therefore been started in collaboration with the Cambridge School of Agriculture. The effect of the quality of the carcass on the weight and quality of the resultant bacon is also being studied. It has already been shown that the fatness of the carcass affects the changes in weight which occur during curing. Fatter sides lose slightly less weight during maturation than lean sides.

Work on the gas storage of bacon has continued on a larger scale, and a gas store capable of holding 25 to 30 sides of bacon is now being tested in a bacon factory. It has already been shown that at least three weeks can be added to the storage life of mild-cured bacon by using an atmosphere of carbon dioxide at a temperature of 5° C. A preliminary study of the effect of salt on mixed cultures of air-borne micro-organisms has shown that it has a strongly selective influence that depends to a large extent on its concentration. Thus, when mixtures of minced pork and salt are kept at a temperature of 0° C., putrefactive micro-organisms predominate when the concentration of salt is below four per cent. and moulds when it is above five per cent.

Corrosion in Canning Practice

As briefly reported last year, the hydrogen evolved during corrosion can diffuse comparatively rapidly through steel, and to some extent through tinplate. This fact is of importance in practical canning, since it influences the rate at which "hydrogen swells" are formed. It has been found that the rate of diffusion varies with different samples of steel, and is affected by the addition of substances known to accelerate or inhibit acid corrosion. The experiments also support the view that the hydrogen, as it diffuses through the metal, is in the atomic and not the molecular state.

Both plain and lacquered aluminium cans have been tested with the principal English fruits. The results with plain and once-lacquered cans were unsatisfactory, owing to the rapid formation of hydrogen swells. The results with twice-lacquered cans are not complete, but it is evident that, where acid products are concerned, aluminium would be even more dependent than tinplate on the protection of the surface by lacquer. Experiment has shown that there is a close correlation between the formation of hydrogen swells with different fruits and the extent of corrosion in strips of steel immersed in concentrated aqueous extracts of these fruits. There is also evidence to suggest that simple "immersion" tests in citric acid may usefully be employed in studying the behaviour of different samples of steel base for the manufacture of cans for fruit.

Metabolism of Fish Fats

Work on the metabolism of fats in fish has continued. Studies of fats from different regions of fish, such as the sturgeon or conger eel, and of marine mammals have been made, and present features of considerable biochemical interest. Perhaps the most striking are concerned with the fats from various tissues and organs of the porpoise. The fats of porpoise and dolphin differ from all other known fats in containing *iso*valeric acid in combination.

The study of the metabolism of carbohydrates in haddock's muscle has been concluded with the observation that freezing to a temperature below a critical point lying within the range −1.6° to −2° C. causes irretrievable damage to the mechanism concerned with the removal of lactic acid. This critical temperature of freezing is comparable with the temperature at which the same phenomenon occurs in frog's muscle. Study of the post-mortem changes in the haddock's liver has shown that a reducing fraction is formed at an intermediate stage between the breakdown of glycogen and the formation of free sugar, but its identity has yet to be determined. While the rate of glycogenolysis in frozen fish's muscle passes through a maximum in the interval of temperature −3.2° to −3.7° C., no such change occurs in the liver, where glycogenolysis proceeds at an ever-decreasing rate as the temperature falls.

Carbon dioxide can be used to reinforce the preservative action of the crushed ice in which white fish is commonly stowed, and the most effective concentration is 30 per cent. In higher concentrations the bactericidal effect does not compensate for the changes produced in the appearance of the fish. Even with 30 per cent., although the period of edibility is prolonged, the appearance is not equal to that of a fresh fish, and after more than 12 days' storage the fish is less suitable for smoke-curing than fish stored for a similar period in air.

Engineering Research

Among the problems of the transfer of matter and energy across the boundaries between phases which are common to engineering and to biological physics, that of the kinetics of the formation of ice occupies a place of special importance in refrigeration. The factors controlling the rate at which ice is formed in a viscous fluid, and their application in determining the freezing point of a complex mixture, such as egg-yolk, have been investigated. Their purely biological implications need not be emphasised here; but from a more immediately practical view-point they may be of assistance in considering commercial methods of measuring freezing points; for instance, in the testing of dairy products, and in

relation to the slow freezing of supercooled foodstuffs, such as butter stored at a temperature of 15° F.

The frosting of grids and pipes is an analogous problem, governed by the same basic factors. Investigations in the experimental hold have thrown light on the way in which the rate at which snow is deposited governs the form of the deposit, and consequently the effect on the coefficient of heat transfer. The same experiments have dealt with some of the relations between the transfer of latent and of sensible heat to cooling grids on the roof of a chamber when only natural convection is operative. When snow is being deposited, the combined rate of transfer of "total heat" (enthalpy) is, of course, augmented by the latent heat equivalent of the deposited water, is retarded by the insulating effect of the layer of snow, but tends to be accelerated again by the increase in the surface. Since, under practical conditions, a considerable fraction of the transfer of enthalpy in refrigerated chambers is effected by the movement of water-vapour, the elucidation of these relations is a matter of considerable importance, and experiments are proceeding.

In recent years the problem of the measurement of humidity in cold stores has also come to the fore, particularly in connection with the storage of meat. Work has been carried out on the measurement of humidity at temperatures ranging down to −20° C. Special attention has been given to the adaptation of the dew-point and the wet-and-dry-bulb methods for use at low temperatures. The work on the transmission of heat between metal pipes and a stream of air has been extended to the case of pipes fitted with helical fins. It is hoped to undertake shortly an investigation of the transfer of heat in condensers and evaporators, and with this end in view the viscosity of a number of refrigerants has been measured over the range from normal temperatures to −20° C.

The New Metropolitan Water Board Regulations

Their Effect on Factory Owners

NEW bye-laws, made by the Metropolitan Water Board under its Act of 1932, which came into force in February last, affect the owners or tenants of every factory or building wherein water supplied by the Board is used. Under these bye-laws, the avowed purpose of which is "preventing the waste, undue consumption, misuse or contamination of water," the Board has taken very wide powers, and they are likely to prove a source of considerable trouble and annoyance to factory owners and others.

The bye-laws are badly drawn, particularly from the industrial point of view. They were evidently prepared primarily to deal with the domestic use of water, *i.e.*, water supplies which are not metered, but are supplied on a rating basis, although the question of meters is dealt with. No distinction is, however, made between metered and unmetered water, the Board apparently considering that users who are paying for every gallon used are as likely to waste it as those who pay on a quarterly or yearly basis with an unmetered supply.

These bye-laws are not applicable to pipes, valves, cocks and fittings which were in use when they came into force, but, (Clause 75) "every person who shall make any alteration or addition to the water pipes or water fittings in connection with any existing supply of water from the Board (other than a repair) shall give notice to the Board of such alteration or addition not later than seven days after the work shall have been carried out." Further, "every person who shall require a new supply or an extended supply of water shall, before any water pipe or water fitting is fixed in or in connection with such supply, give the Board at least three day's notice of his intention." The result of giving notice will, of course, be a visit from an inspector, and it is interesting to note how far these regulations will carry him. There is a regulation that, except for drinking and dietetic purposes and for fire hydrants, every M.W.B. supply must pass through a ball valve into a break or head tank. Direct connection from M.W.B. to tanks or cisterns used for other water or other liquids was forbidden under Clause 38, but the Ministry of Health made an exception if the M.W.B. water enters by a tap the outlet of which is 9 in. above the top of the tank.

It might be supposed that, once the water had got safely into a break tank with no possibility of getting back into the mains and contaminating the water supply, the M.W.B. would lose interest in it; but that is not the case. Under the definitions, "a 'distributing pipe' means any pipe conveying water supplied by the Board from a storage cistern or feed cistern, or from a hot water apparatus and under pressure from such cistern or apparatus." In other words, all water pipes and fittings throughout the factory, if they have been put in since the bye-laws came into force. come under the regulations right away to the point where the water enters into a process or runs down the drain. Steam and condensate pipes are exempt, though the bye-laws do not say so. The material and thickness of pipes is laid down, but pipes do not need to be tested and stamped by the Board.

When we come to "taps" (remark the domestic note), valves, including ball valves, non-return valves and cocks, the Board gets active. These must all be submitted to the Board for testing and stamping before they may be fixed or used. There are, naturally, fees to pay for this privilege, ranging from 4d. for taps up to ¾ in., up to 18s. for a 12-in. valve, the rate being 1s. 6d. per inch for a 2 in. and upwards. Furthermore, they must all stand a test pressure when fully assembled of 300 lb. per sq. in. This is an extreme test when one remembers that with a break tank on the roof of a 100-ft. building the maximum working pressure is only a little over 40 lb. per sq. in.

The Board seems to have overlooked the fact that a little grit will cause a valve tested to 300 lb. to leak just as readily as one tested to 30 lb. Then screw-down valves and ball valves with metal valves on a metal seat are barred. There must be a leather or fibre washer.

Clause 37 is an example of bad drafting. It runs as follows:

"*Draw taps, stop valves and gate valves.* (a) All draw taps or stop valves shall be of the screw-down kind. (b) The expression screw-down stop valve shall not include stop valves of the gate or straight-through type, but such stop valves, if of brass or gunmetal with spindles of manganese bronze or alloy of equal strength, provided they comply in other respects with these bye-laws and are sound, suitable and efficient, may be used on distributing pipes, hot water and circulating pipes and on branches to control groups of fittings."

The Ministry of Health insisted upon stop valves with cast iron bodies being allowed. Clause 69 states that "a person shall not draw or use water supplied by the Board through any hose or movable pipe." There must presumably be exceptions to this rule if cars and factory floors are to be washed, but none are mentioned.

A chemical engineer who has made a close study of the new bye-laws ventures to think that there is a boom coming in the well-sinking business in London.

Forest Products Research

Data for Timber-Using Industries

UNDER the title of Forest Products Research Records the Department of Scientific and Industrial Research are issuing a new series of booklets (H.M. Stationery Office, 6d. net) which will give a concise account of all phases of the work carried out at the Forest Products Research Laboratory. These records will appear at irregular intervals at the rate of about 10 a year. Record No. 1, "The Testing of Timbers at the Forest Products Research Laboratory," serves the dual purpose of explaining the scope of the Laboratory's activities and the reasons for the testing of timbers. Record No. 2 ("Strength Tests of Structural Timbers. Part 1. General Principles, with Data on Redwood from Gefle and Archangel") is the first of a number of Records which will deal with the subject of timber mechanics.

Recent Progress in Petroleum Chemistry

Some Papers read before the American Chemical Society

RECENT progress in petroleum chemistry was reported in a series of papers read before the American Chemical Society at its San Francisco meeting, August 19-23. In a paper on the pressure pyrolysis of paraffin hydrocarbon gases, H. Tropsch, C. L. Thomas and G. Egloc stated that propane, n-butane, isobutane and mixtures containing these gases have been pyrolysed at 525-575° and at 725 lb. per sq. in. pressure. The gases produced contained paraffin hydrocarbons of lower molecular weight than the hydrocarbon charged along with ethylene, propane and butenes. At a sufficiently long contact time a part of the olefins were pyrolysed to liquid products. By catalytically polymerising the olefins produced liquids it is estimated that 1,000 cu. ft. of butanes would give 10 gal. of liquid product, 90 per cent. of which is gasoline having an octane number of 77 or a blending value of 93 octane by the C.F.R. motor method.

Utilisation of Propane and Butane

The industrial utilisation of propane and butane was the subject of a paper by W. Z. Friend, who pointed out that the Bureau of Mines Report M.M.S. 375 shows a 23.7 per cent. increase in marketed production of liquefied petroleum gases in 1934 over 1933 and a 73.0 per cent. increase in volume of these fuels used for industrial purposes during the same period. A summary was given in outline form of the principal industrial applications and processes to which propane and butane have been applied other than applications as chemical raw material. Industrial applications described were heat treatment of ferrous and non-ferrous metals; metal melting; baking, fruit ripening and other uses in food industries; glass melting and annealing and other uses in ceramic industry; oxypropane cutting of iron and steel; air heating and conditioning; textile plant applications; use as internal combustion engine fuel; railroad applications; use as refrigerants; use as solvents. A number of properties of propane and butane were discussed with special reference to their significance in industrial applications. Diagrams of typical industrial plant storage, vaporising and regulation equipment were shown, and the economics of supply and price were discussed. Attention was also called to the possibility of wide variety of applications in the same plant using the same propane first as solvent, then as refrigerant, and finally as fuel. An example was given of the possible use in the operation of cold storage or ice manufacturing plants through vaporisation of propane, then the use of the gas as a domestic cooking and heating service and as a fuel for gas engine-generator sets furnishing electrical supply.

Tests for Lubricating Greases

Distinctions between chemical laboratory analyses, physical laboratory tests, laboratory service tests and road tests for lubricating greases were discussed in a paper by E. M. Klemgard. Laboratory service tests are valuable for speed, economy and preciseness, but road tests are necessary for final evaluation of service properties. Detailed procedures for determining serviceability of five different classes of chassis lubricants were given. A laboratory service test incorporating a worm and roller steering gear equipped with anti-friction bearings and a worm and sector gear with plain bearings was discussed and the study of eight lubricants tabulated. A device for the study of water pump grease in the presence of boiling water was also described.

A new procedure for the potentiometric determination of mercaptans was described by M. W. Tamele and L. B. Ryland, the quantitative determination of mercaptans being based on the precipitation with silver nitrate. The titration is performed in an alcoholic solution of sodium acetate, using enough alcohol to dissolve the hydrocarbon sample, and titrating with a solution of silver nitrate in isopropyl alcohol. The end point is determined potentiometrically using a silver electrode as an indicator, thus avoiding an excess of silver nitrate and eliminating the danger of simultaneously precipitating impurities. The method is applicable to coloured solutions as the selection of the end point is not dependent on a colour change of an indicator.

A high efficiency method of distillation applicable to certain classes of compounds was described by A. C. Bratton, W. A. Felsing and J. R. Bailey. The trial distillation of a mixture of 0.5 c.c. of pyridine, 0.5 c.c. of 2-methyl pyridine, and 25 c.c. of hydrocarbon resulted in complete separation of the two bases. Using dimethyl aniline and diethyl aniline in three types of hydrocarbon oils as carriers established certain facts. The explanation of these phenomena was indicated by a study of pyridine, 2, 2, 4-trimethylpentane and toluene. Data from these experiments augmented by Eotvös constants explain amplified distillation on the basis of the imperfection of solutions of the constituents in the carrier oil. Further study established conditions under which amplified distillation is applicable and indicates the importance of positive deviations from ideality of vapour pressure of solutions involved.

Discussing the photochemical formation of colour, haze and reaction products in hydrocarbons, J. C. Morrell, W. L. Benedict and G. Egloff stated that pure hydrocarbons exposed to the carbon arc light in oxygen developed peroxides, acids and aldehydes. Colour and haze formed only in the presence of sulphur or n-propyldisulphide. In nitrogen or hydrogen reaction of sulphur with saturated hydrocarbons occurred, resulting in colour formation and evolution of hydrogen sulphide. Unsaturated hydrocarbons similarly exposed formed colour, hydrogen sulphide and mercaptans. n-Propyldisulphide reacted with the hydrocarbons in nitrogen or hydrogen to form mercaptans, but caused colour formation only in 2, 2, 4-trimethylpentane and cyclohexane. The changes observed affected only a small proportion of the hydrocarbons since no change in bromine number or refractive index occurred; the results were similar to those obtained with gasolines.

Deasphalting in the refining of lubricating oils was the subject of a paper by U. B. Bray and W. H. Bahlke, who said the properties of liquid propane have been found to be such that it is advantageous in separating asphalt, resins, wax and non-paraffinic constituents from the paraffinic constituents of a reduced crude to produce high-quality lubricating oils. The desirable paraffinic constituents are quite soluble in propane from below the normal boiling point to a temperature near the critical. For each of the undesirable constituents there exists a certain temperature range where their solubility is so low in comparison with the desirable paraffinics that effective separation can be made through the use of propane. The solubility of these compounds had been made the subject of a physico-chemical investigation and the action of propane in deasphalting and deresining was explained with the aid of phase diagrams.

A New Laboratory Balance

Aperiodic Projection

THE "Empire" aperiodic projection balance, supplied by Baird and Tatlock, has a beam 13.5 cm. long, constructed of special aluminium alloy and fitted with agate knife-edges working on agate planes. The maximum load is 200 grams, the sensitivity remains approximately constant from zero to full load, and the constancy of successive readings is within 0.2 milligram. The air-damping device is extremely reliable, and the balance is at rest in 7 to 12 seconds after actuating the release. By means of a lamp and an optical train, an image of the micro-scale is projected on a matt glass screen. Current for the lamp is derived from a small transformer connected to the mains or from a 4-volt accumulator. The balance is provided with the conventional type of scale and pointer, one division of the macro-scale being equal to 10 milligrams. The micro-scale consists of 100 divisions on each side of a central zero, and is adjusted so that one division = 1 milligram. On the projection screen, one division occupies a length of approximaately 1 millimetre, so that 0.2 milligram may be readily estimated. The balance is provided with variable adjustment for the sensitivity, as well as an independent adjustment for zero.

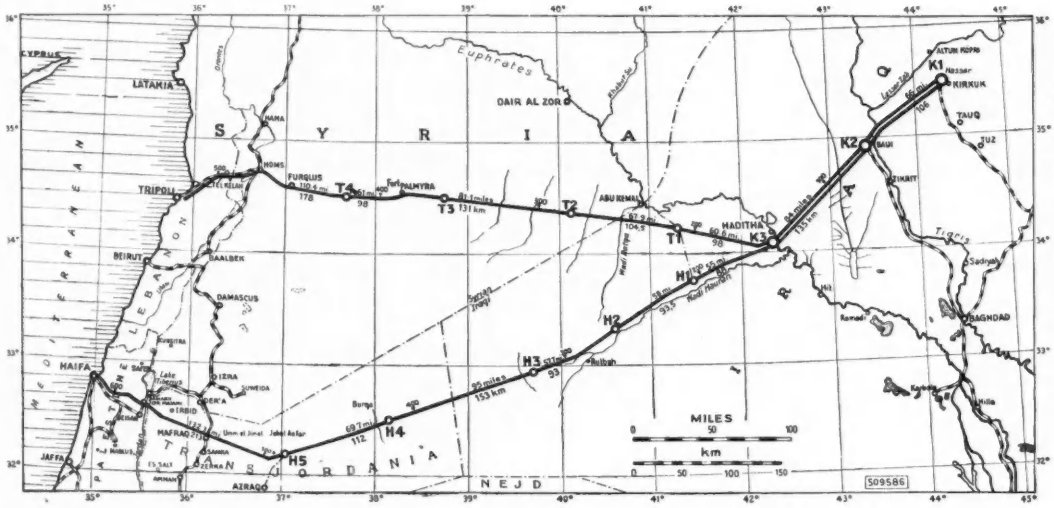

Fig. 1. Map showing the route taken by the Iraq pipe line. At the places marked by the letters K1, K2 and K3 are situated pumping stations equipped with Sulzer Diesel engines driving the oil pumps, each engine developing about 500 B.H.P.

Romance of the Iraq Pipe Line

The Iraq pipe line, connecting the Mesopotamian oil fields with the harbours of Haifa and Tripoli on the Mediterranean coast, was put into service officially on January 14, 1935. This article is reprinted from the " Sulzer Technical Review " 1935, No. 2, the accompanying photographs having been taken by Sulzer erectors engaged in erecting Diesel engines at the pumping stations.

FOR the transport of oil obtained in Mesopotamia, the Iraq Petroleum Co., Ltd., has built a pipe-line to the Mediterranean. It is of particular interest because of its length—two pipes totalling 1,200 miles—and it runs mostly through absolutely desert regions. The oil flows from the reservoirs erected near Kirkuk (150 miles north of Baghdad) to Tripoli and Haifa on the Mediterranean coast, being passed from one pumping station to another. The pipe-line from Kirkuk to Tripoli was finished in August, 1934, and the line from Kirkuk to Haifa in October, 1934. Up to the end of 1934 more than 100,000 tons of oil had already been sent through the line.

Iraq is a desert region bordered on the north by Turkey, on the east by Persia, on the south by the Arabian desert and on the west by Syria. The Iraq Petroleum Co. acquired the sole right to exploit all the oil in the vilayets of Baghdad and Mosul, east of the river Tigris. This includes the district round Kirkuk. The concession holds for 75 years, after which time all the plant, buildings, pipe-lines, transportation facilities, machinery, etc., belonging to the company is to revert to the Government of Iraq.

The oil district investigated up to the present, north-west and south-east from Kirkuk, is approximately 40 miles long and between 1 and 2 miles in width, with an area of about 50 square miles. The company has at present drilled 32 wells, all of which yield oil except one. With the exception of two wells, all of them yield more than 1,000 bbl. per day. The wells vary in depth from 1,200 to 3,300 ft. In Fig. 6 oil is issuing from the rock on the right and flowing into the bed of the stream on the left. Fig. 4 shows a native emptying the crude oil into a hole, where it is left to clarify. The oil thus obtained was refined in very primitive stills (Fig. 3). heated by means of the residues remaining from the oil previously treated.

The rainfall in Iraq territory fluctuates between 6 in. per annum in the south and south-west and about 20 in. in the north-east. The average maximum daily temperature in July is 110° F. and the average minimum in January a little under 40° F. The extremes are 15 to 20° above and below these temperatures. In June, July and August there is often no rain at all. Although cases of automobiles being stuck in the mud and great dust storms are frequent, still, during half

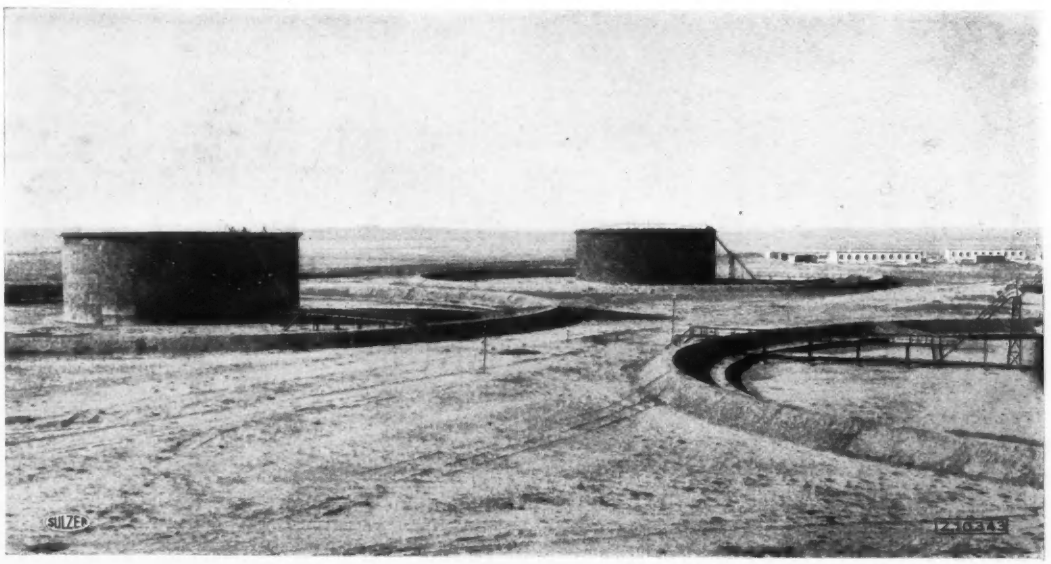

Fig. 2. Oil tanks at a pumping station surrounded by safety trenches. The tanks have a capacity of about 11,000 tons each, and are fitted with floating covers

Fig. 3.—Oil refinery as worked by the natives in Iraq. The furnace is heated by the residue remaining from the refining process.

the year it is possible to travel by car in some comfort almost anywhere in the country, except in the hills, even across large areas where there are no roads.

The principal difficulties encountered in connection with the laying of the pipe-line were entailed in providing water for the pumping stations, acquiring means of transport, and distributing 120,000 tons of pipe 12 in. in diameter along the route, and, further, in maintaining some thousands of workmen far from supply bases; all these problems had to be solved before the actual work of laying the pipe itself could be undertaken. The work of laying the pipe had often to be carried out under the most unfavourable weather conditions imaginable. In summer it was sometimes necessary to work at temperatures of 100 to 120° F. In addition to the scorching heat, there were then often also severe sand storms, which made it necessary to interrupt the work temporarily. In winter the temperatures measured were often far below freezing point. Nevertheless the work was continued whenever possible, in order that it might be brought to a termination within the time stipulated.

Fig. 4.—Native pouring crude oil into a hole in the earth where it clarifies.

Surveying was commenced in 1928, but the construction of the actual pipe-line was not put in hand until 1932. The whole work of laying the pipe-line was completed nearly a year prior to the date stipulated in the contract with the Government, the work being done by native Arabs under the leadership of Europeans and Americans. During the later stages of the work it was often possible to lay as much as 5½ miles of pipes in one day.

The pipe-line begins in duplicate at Hassar, near Kirkuk, approximately 1,000 ft. above sea level. The pumping stations are connected to each other by means of telephone and telegraph lines running parallel to the pipe-line. From Hassar the double pipe-line passes through the Kirkuk plain in a south-westerly direction to Fatha Gorge, where it crosses the River Tigris at about 400 ft. above sea level. Since the river bed consists of rocky ridges, running diagonally, the pipe was laid in a trench, for the construction of which blasting was necessary.

From the Tigris the line continues in a south-westerly direction, crossing two or three sandhills of loose, brown sand and crossing at mile 95 the Wadi Tharthar, a depres-

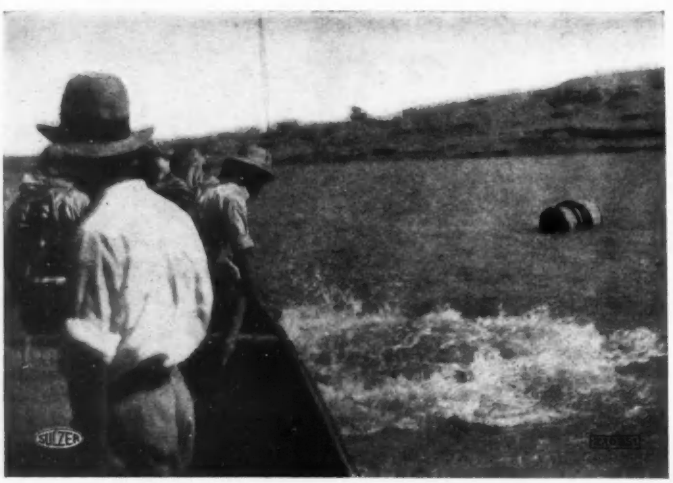

Fig. 5.—Searching for a leak in one of the pipes laid across the River Tigris. The pipe has been filled with compressed air and the bubbles indicate the position of the defect.

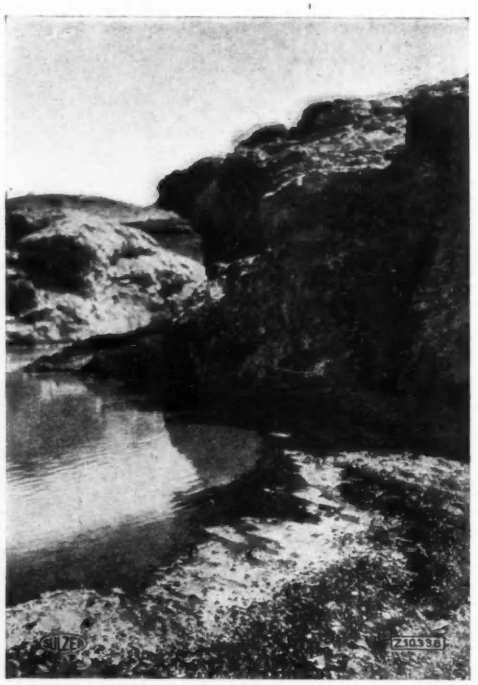

Fig. 6.—In the Kirkuk oil fields. Petroleum issuing from the rock on the right and flowing into the river bed.

sion about 200 ft. above sea level. The Wadi Tharthar and the adjoining area presented some difficulty, especially in winter, on account of seven or eight miles of salt marsh, alternating with gypsum. Thereafter the route continues on flat gypsum outcrops until within a few miles of the Euphrates River, the approaches to which are steep and rocky. Between Tharthar and Haditha on the Euphrates, the gypsum rises to a summit of 750 ft. above sea level. The Euphrates was crossed south of Haditha, at a point where the river bed, which is rocky and overlain with gravel, is most nearly level.

The pumps in the stations are driven by Diesel engines. Each pumping set is designed for handling 3,420 m^3 per day at a pressure of 800 lb./ sq. in.

Locating a Fracture

In Fig. 5 it is shown how the position of a fracture in the pipe-line was located in the section laid through the Tigris. The pipe was filled with compressed air and the position of the leak was indicated by the air bubbles rising to the surface of the water. Fig. 2 shows the oil tanks at a pumping station. Each of these tanks has a capacity of about 11,000 tons and is surrounded by a safety trench of sufficient capacity to take the contents of the whole tank. This prevents any loss of oil in case of leakage. The tanks are also provided with floating roofs.

Approximately 6 miles west of Haditha (150 miles from the start) the line bifurcates, the southern arm going in a south-westerly direction to Haifa, and the other in a direction almost directly west to Tripoli. The southern section of the pipe-line—half of which traverses territory under British mandate—passes through Rutbah and terminates at Haifa on the Mediterranean, a distance from Haditha of 467 miles. At Rutbah the lines rises to 2,000 ft. above sea level. Before reaching Rutbah it crosses the former main caravan route between Damascus and Hit, being the half-way point between Damascus and Baghdad. Leaving Rutbah the line takes a more westerly direction and passes over a flat desert, which gives place at times to rather rolling, stony country. About 80 miles west of Rutbah is the Trans-Jordan border, and approximately 60 miles further on the line strikes the lava country.

The northern section of the line is mainly within French Syria, and from the point of bifurcation at Haditha the route runs practically due west to Palmyra and thence to the northern terminal at Tripoli, a distance of 381 miles. From Haditha the route proceeds more or less parallel with the River Euphrates up to the Wadi Rutka, which marks approximately the Syrian-Iraq frontier. Here the ground is generally rocky with numerous ridges.

The Pumping Stations

The pumping stations equipped with Sulzer Diesel engines were put into service without any difficulty in 1934. A total of 18 Sulzer Diesel engines have been installed. Each engine has five cylinders of 365 mm. bore and 550 mm. stroke and develops 500 b.h.p. at 300 revs. per min. Because of the frequent sand storms, the valve gear of the engines is totally enclosed. In other respects the engines are designed according to the proved Sulzer four-cycle system, *i.e.*, the five cylinders are united into one block which extends down to the bedplate and includes a part of the crank casing. The engines work with direct injection of fuel. The fuel pumps and injection valves have been particularly carefully designed by Sulzer Brothers on the basis of their many years' experience, so that no coking of the nozzles occurs even when the engines are working continuously. The engines can therefore work at the best possible thermal efficiency however long they run. As in all Sulzer four-cycle Diesel engines with direct injection the camshaft runs in an enclosed trough. Bearings and cam disks are provided with forced lubrication. Special mention should be made of the apparatus fitted at the end of the camshaft for regulating starting air, this method ensuring easy starting of the Diesel engines. Shutting off the starting air and the change over to fuel takes place automatically.

The first shipments of oil passed through the pipe-line have already been notified, although the quantities mentioned are, of course, only temporary figures. It is intended finally to deliver about 4,000,000 tons of oil per annum from the oil fields round Kirkuk to the two terminal stations of the bifurcated pipe-line. Actual trials have shown that the oil requires about four days to make the journey through the desert.

Science and the Salvation of Civilisation

Professor F. Soddy Urges the Need for Unity

AN appeal to scientists to unite and demand a chance to solve the problem of "poverty amid plenty" was made by Professor Frederick Soddy, Lees Professor of Chemistry at Oxford University, in an interview published by the "News Chronicle" on Monday. In 1920 Professor Soddy objected to the universities, without their knowledge or consent, being brought into the War Office's peace-time organisation for developing chemical warfare research. During the war, like other chemists, he was roped in to do research for the Government on poison gases among other things. Since then he has refused to have anything to do with it.

"I am quite satisfied," said Professor Soddy, "that any attempts to protect large towns from the danger of destruction from the air are likely to prove illusory. The reasons are the increasing range of aircraft since the war, and the increasing knowledge of poison gases and their use in warfare. Against such measures no adequate defence is possible. Sooner or later a swarm of bombing aircraft is almost certain to get through the defences and create inconceivable havoc. The methods suggested by the Government appear to me to be childish and peurile. Surely to the average man the proposals are ridiculously inadequate.

Excluded from Key Positions

"It is high time that the technological and scientific experts themselves should unit to influence the Government as to the right uses of science. An effective international understanding among scientific workers would be a big step towards making wars impossible. It is amazing to me how scientists are excluded from any key positions in public affairs unless it is known in advance that they are people who can be relied upon to bomb their own mothers and get a decoration for it.

"Among the rank and file of scientists there is as great a horror of the perversion of science to warlike purposes as there is among the general public. But this democratic feeling has yet to find expression in those who control science and its relation to the Government. The resources of science are already sufficient to destroy civilisation, and it is sheer folly for scientists to go on with their researches unless they have some guarantee that they, and not the old type of ruler, are to be in charge of the uses that are made of them.

An Entirely New Situation

"An entirely new situation has resulted through scientific advance making it possible to produce plenty for all, whereas all the old systems of sociology and government are literally based on the assumption that we are still living in an age of scarcity. I am convinced that until some realisation of this change is represented in politics and government there is no real solution to the problem of war and internal social dissension. In my view, any too independent and fearless an inquiry into this subject is not welcomed by those at present in power. It is hard to make the public realise that, but for vested interests which have grown to be so immense, science could solve all these difficult social problems. So far, independent scientific investigation as to the causes of the trouble has not been given a chance. It is a ghastly reflection, both on the public and the Government, that they seem less concerned with what science is able to do to uplift the whole standard of life than with its uses in maintaining the existing state of things."

Trade Openings in Czechoslovakia

A Growing Demand for Chemicals and Dyes

THE time must come when United Kingdom exporters should begin to take an increasing share in the trade of Czechoslovakia, says Mr. H. Kershaw, O.B.E., commercial secretary to the British Legation at Prague, in a report on "Economic Conditions in Czechoslovakia" recently published by the Department of Overseas Trade (H.M. Stationery Office, price 2s.). Mr. Kershaw urges that United Kingdom manufacturers should spare no efforts to grasp the present favourable opportunity to consolidate their position in this market. It is not only that the lower external value of sterling confers an advantage on the United Kingdom exporter, but he should reap substantial benefits in any trade expansion from the fact that the United Kingdom imposes no restrictions on payments for Czechoslovak imports into the United Kingdom, and from the fact that, conversely, other important countries exporting to Czechoslovakia are handicapped through mutual clearing, compensation, quota and other import obstacles. It is significant to note that there is a general desire among importers and manufacturers to turn to the United Kingdom for the supply of important materials such as chemicals and dyes, prepared leather and skins, machinery and many semi-manufactured products which were formerly imported from other countries. The principal United Kingdom imports into Czechslovakia consist of textiles and yarns, but this trade is of long standing, and the United Kingdom exporters may be confidently relied upon to lose no opportunity of extending their sales in this market.

A Definite Opportunity

There are other branches of trade in which United Kingdom exporters would be well advised to cultivate this market, even if there be no immediate prospect of any substantial turnover. There is a definite movement to trade with the United Kingdom on a larger scale, but the opportunity may pass.

Meanwhile, however, there is a large number of commodities, the trade in which could be materially increased if United Kingdom exporters seized the opportunities. In addition to chemicals, brief mention may be made of special kinds of instruments and certain grades of oils. The present opportunity should be seized to increase, as far as possible, existing trade in such commodities as linoleum, and other floor covering, rubber goods, pharmaceutical products, perfumery, etc. The present foreign exchange and other import restrictions clearly limit the extent of the results which could be achieved at once. On the other hand, definite efforts should certainly be made now to prepare the ground for a trade offensive in the future. In the meantime it should be noted that the Czechoslovak authorities, fully alive to the fact that a revival in world trade must be accompanied by the gradual abolition of irksome restrictions, are from time to time reducing the large number of articles which, during an anxious period, were subjected to the import foreign-exchange restrictions.

Practical Suggestions

The most practical way is to appoint an enterprising agent of good repute, proved ability, and possessing a thorough knowledge and experience of the local market. The selection of such an individual is by no means an easy task, and insufficient attention is often paid to it. These negotiations require time and patience. Not only should the commercial section of the British legation be consulted, but also, where expedient, local banks, chambers of commerce and other third parties. In order to minimise travelling expenses it has sometimes been found quite practical and successful to entrust a traveller with the appointment of an agent for several firms dealing in allied but not necessarily competing articles. It is, above all, advisable that the travelling representative of a United Kingdom house should speak either French or German when visiting Czechoslovakia.

Dealing with the trade and industry of Czechoslovakia, the report states that 1934 was, on the whole, a quiet year from the standpoint of the mineral oil industry. There were no new Government measures affecting this trade such as characterised conditions in previous years (obligatory mixing of alcohol with petrol in 1932, increased taxation on petrol and increased road taxes in 1933), but the after-effects of these measures had an unfavourable influence on motor traffic in 1934, as many potential buyers refrained from buying cars because of the heavy operating expenses. These circumstances had affected, of course, the mineral oil industry, in so far that there was no noticeable expansion in its production. The consumption of lubricating oils compared with the year 1933 increased by 1.7 per cent., but mainly on account of the larger consumption of industrial lubricants (improved industrial activity) whereas motor oil consumption declined by over 2 per cent. A similar tendency was shown in the consumption of petrol and petrol alcohol mixture, which registered a decline of not quite 2 per cent., the consumption of petrol for industrial purposes increasing slightly, but that for use as motor fuel declining. In consequence of the growing use of kerosene heaters and stoves the kerosene consumption increased by 2½ per cent. and also the production of gas oil was slightly larger owing to the increased number of Diesel motors. As regards asphalt, the increase in consumption, amounting to about 2.6 per cent., was due to more extensive road works carried out last year. However, it is interesting to note that this increase was due exclusively to home production, imports having declined quite considerably.

Mineral Oil Industry

It is difficult to gauge the prospects of the mineral oil industry in 1935. Preparations are in train for the amendment of the law regarding the taxation of motor cars. Suggestions have also been made for further increasing the quota of alcohol in the petrol-alcohol mixture, *i.e.*, from 20 to 25 per cent. In these circumstances the prospects of the industry remain uncertain.

In the Aussig Chemical Verein, Czechoslovakia possesses the most extensive chemical-making plant on the Continent outside Germany. This concern has undergone extensive developments during recent years, aimed at rendering Czechoslovakia independent of importation in respect of all essential chemicals. Modern nitrate plants—recently extended in connection with the explosives industry—are in full operation, supplying most of the country's requirements of nitrate fertilisers. Further progress has lately been made in the manufacture of coal tar dyestuffs, whilst domestic factories are now able to supply practically all requirements of the important soap-making industry, including soda. Developments have also occurred in the production of carbon black according to a Czechoslovak patent process, which is said to be proving most successful. Citric acid is another basic chemical of which considerable quantities are now produced, partly for export.

Medicinal Chemicals

During the past year or two the production of medicinal chemicals and patent medicines has been largely extended, and import opportunities for such goods now appear to be on the decline, apart from a few specialities such as insulin, which, however, is also now increasingly made in the country. All acids and salts are produced in sufficient quantities and partly exported. The chemicals which do not yet appear to be entirely covered by the Czechoslovak industry are various primaries and intermediates required by branches of enterprise such as the plastics industry; solvents for the manufacture of dopes and varnishes, etc. Butyl alcohol and solvents belonging to this group are, however, now produced by Czechoslovak factories, as are also benzol, carbolineum and other derivatives. In spite of these developments the textile industry evinces increasing interest for certain British aniline dyes, as an alternative to German sources. It is also to be noted that the important Bata (footwear) factory have taken up the production of certain chemicals for their own requirements, and for sale to other consumers; this concern now occupies an important place as producers of chemicals for the rubber and tanning industries. The same concern has entered the paper-making branch, based on its own extensive requirements of certain kinds of papers, and is now said to be experimenting in the manufacture of rayon. Several Czechoslovak factories have seriously taken up the production of celophane paper.

United Kingdom, French and German importers of this material.

The stock position of the fertiliser trade has eased considerably in the past 15 months, and there has also been some increase in actual production which, for the whole of 1934, is put at approximately 92,000 metric tons of nitrogenous fertilisers, and 245,000 tons of superphosphates, Thomas meal, etc. Excepting purchases of about 11,550 tons of Chile saltpetre and 23,400 tons of Thomas meal, chiefly from France but partly from U.S.S.R., imports of fertilisers in this group were again practically non-existent. There were, however, imports of kainite and 38-44 per cent. potash salts totalling about 77,000 tons during 1934. The kinds and amounts of artificial fertilisers consumed in Czechoslovakia in the year 1934 were as follows, in metric tons (the corresponding figures for 1933 in brackets): Sulphate of ammonia 43,504 (37,836), Chili saltpetre 11,537 (13,562), calcium nitrate 25,662 (21,301), potash saltpetre 11,751 (11,490), calcium cyanamide 23,424 (20,247), superphosphates 145,920 (120,504), Thomas meal 115,552 (97,464), bone dust 4,450 (7,296), kainite 24,377 (21,786), salts of potash (18-24 per cent.) 1,050 (1,120), salts of potash (38-44 per cent.) 45,141 (36,376), sulphate of potash 292 (0); other chemical fertilisers 154 (281), offal 5,647 (6,335). Most of the categories showed an increase, but there is considerable room for expansion in the use of artificial fertilisers in the country.

Tables are included in the report showing the provisional figures for principal imports from and exports to the United Kingdom in 1934 compared with the actual figures for 1933. Imports included: Chemicals £25,139 in 1934 (against £16,800 in 1933); fatty oils £23,540 (£21,444); varnishes, colours, pharmaceutical wares and perfumery £29,409 (£24,069); dyeing and tanning materials £3,018 (£3,756); gums and resins £12,019 (£6,129); and mineral oils £2,139 (£5,417). Exports to the United Kingdom included chemicals £112,400 in 1934, against £94,156 in 1933, and varnishes, colours, pharmaceutical wares and perfumery £25,991 in 1934 against £22,252 in 1933.

Principal Spanish Imports

Britain's Share in Chemical and Allied Trades

ACCORDING to a report on "Economic Conditions in Spain," by Mr. A. Adams, formerly commercial counsellor at the British Embassy at Madrid, published by the Department of OverseasOverseas Trade (H.M. Stationery Office, price 1s. 6d.) the U.S.S.R. is the largest single source of fuel oils imported into Spain, supplying over 60 per cent. of the Spanish imports of motor spirit, more than two-thirds of gas oil, approximately half of fuel oil and a fair proportion of kerosene and lubricants. The other principal source is the United States, which have consistently supplied half of the lubricating oil used in Spain for several years. The United Kingdom supplies lubricants on a comparatively small scale. Imports of fuel oil have increased substantially since 1932. The U.S.S.R. supplied 116,000 tons in 1932, 90,000 tons in 1933, and 102,000 tons in 1934, while the United States starting from 3,000 tons in 1932, sent over 34,000 tons in 1933, and over 118,000 tons in 1934, taking first place over the U.S.S.R. Rumania, which was third in the scale of importance as a supplier of all classes of oils and petrols until 1933, only sent 10,000 tons of motor spirit in 1934.

Imports of Asphalt

The only petroleum product in which the United Kingdom's exports to Spain are of importance is asphalt. From 1932 onwards total imports of asphalt have increased reaching over 65,000 tons in 1934. Supplies from the United Kingdom amounting to about half the total imports, have followed a parallel course, while other formerly important suppliers, Germany and Holland, have all lost ground. Fresh competitors in this field are Mexico, whose exports leapt from a modest 86 tons in 1932 to nearly 8,000 tons in 1933 and over 10,000 tons in 1934, and France, which appeared in 1934, with about one-twelfth of the amount supplied by the United Kingdom.

There is a certain demand for organic fertilisers with a small nitrogen content. The organic fertiliser usually imported is guano, but there is no reason why United Kingdom manufacturers should not take advantage of this demand to extend their activities to Spain, more especially as there is at present no impediment to such imports.

Imports of sulphate of Ammonia increased from 1929 to 1932 when they reached 440,000 tons, of which the United Kingdom share was 174,000. In 1933 imports fell to 289,000 rising again in 1934 to some 333,000 tons, but the United Kingdom share was only about 47,000 tons. The principal suppliers were Belgium and Holland, each with over 100,000 tons. Holland in particular has increased her exports to Spain within the last three years.

In pharmaceutical specialities Germany and France are the principal suppliers, though France, who two years ago supplied half the imports into Spain, now yields first place to Germany; Italy, Switzerland, the United Kingdom and the United States of America follow some way behind and the United Kingdom's already small share appears to be dwindling.

Imports into Spain of kaolin over the last three years have risen slightly towards the 1930 level, although the increase in volume has been accompanied by a decrease in value. The United Kingdom is the chief supplier with 15,160 tons out of 19,844 in 1934. Belgium has lost ground and France, with close on 1,000 tons, has risen from fourth to second place. Imports of gypsum have remained steady over the last three years with a slight fall in value. France still supplies approximately half the total amount, but with a tendency to decrease; Belgium, holding the second place, is also losing ground. The United Kingdom share of the trade rose from 5,000 to 7,000 tons in 1933 and maintained this rise in 1934. Germany is the only supplier whose imports have advanced in value as well as in quantity over the last three years.

Imports of tallow and other animal fats remained fairly steady over the period 1932-34 with a downward tendency in the last year. The Argentine increased its share in tallow to close on 50 per cent. In "other" animal fats the United Kingdom share of the trade was steady. The comparative steadiness of imports is due to the quota on these two products which restricts their importation.

Unrefined animal oils are obtained almost entirely from the United Kingdom. These imports have fallen considerably, owing to the restrictive quota. The United Kingdom has more than held her own in the toilet soap trade in a slightly declining market.

Chemical Insecticides

Imports of chemical insecticides, especially of those based on cyanide of potassium and arsenical salts, show an upward tendency and, while Germany holds the largest share of imports, the United Kingdom, together with France and the United States of America, supplies the bulk of the rest. Imports of chloride of lime and alkaline hypochlorites have more than doubled since 1932, and are above the relatively high level of 1931.

Imports of celluloid have risen since 1932 to 910,515 pesetas in 1934. Germany is again the principal supplier, but lost ground in 1934. The United Kingdom increased her share from 48,000 kg. in 1935 to 52,000 in 1934, out of a total of 196,973 kg. France also improved her position.

Regarding production, the report states that one of the important agricultural questions in Spain is that of olive oil. A really "bumper" oil crop has not been seen in Spain since 1930, but it is paradoxical that just after the application of Government measures having as their end the creation of an effective demand in Spain for olive oil, the crop should be very much less than the previous three years. In 1932 the crop was just over half of 1930, but over three times 1931. In 1933 the harvest was approximately the same, although slightly lower than the previous year. In 1934 there was a decrease of about 12 per cent. on the previous year.

How to Prevent Factory Accidents

Combined Experience of Three Chief Home Office Officials

THE Royal Society of Arts has just issued an illustrated pamphlet containing three lectures on factory accidents, recently delivered before the Society by leading authorities on the subject. The titles of the lectures are "Factory Accidents: Their Prevalence, Distribution and Causation," by Mr. D. R. Wilson, Chief Inspector of Factories; "Factory Accidents: Their Principal Causes," by Mr. G. Stevenson Taylor, Deputy Chief Inspector of Factories; and "Factory Accidents: Their Prevention," by Mr. Leonard Ward, Deputy Chief Inspector of Factories. The authoritative character of the lectures is evident, and owners and managers of factories, officers in charge of machine shops and others connected with, or responsible for, the safety of factory employees, would be well advised to obtain copies of the pamphlet, which represents the combined experience of the three leading officials in the Factory Department of the Home Office.*

Mr. D. R. Wilson's lecture gives statistics showing that in 1928 there were 343,401 industrial accidents (2,285 fatal) affecting a population of 7,146,000, compared with 170,976 road accidents (6,138 fatal) affecting a population of 42,769,000. The number of industrial accidents was almost exactly double the total number of road accidents, while, the converse holds good for the fatal accidents. The position has, however, now altered, since road traffic accidents have increased since 1928, the total for 1933 being 35 per cent., and the fatal 15 per cent., in excess of those for 1928. Little importance can be attached to the population figures, as the length of exposure to risk obviously differs enormously in the two groups.

Chemical Industry Fatalities

Mr. Wilson gives a table of accidents in 19 sample industries, divided into groups with high, average and low incidence. The chemical industry appears sixth in the list (the top of the average incidence group) with 4,013 accidents per 100,000 persons employed. In a subsequent table the 19 sample industries are rearranged, showing in order of demerit the number of fatal accidents per 100,000 employed. This order differs considerably from the earlier order, and chemicals appear second in the list with a fatality rate of 51 per 100,000 persons employed.

An accident, as a rule, is due to a momentary conflict between animate and inanimate matter. In some few cases the cause is well defined; in most, however, it is complex, but it may always be regarded as being composed of two factors, one impersonal (relating to the object, material or machine) and the other personal (relating either to person injured or perhaps to some other person). If accidents could be classified according to the relative importance of these two factors, we should have at one extreme those due to the unforeseen failure of material (such as the bursting of an abrasive wheel), and at the other, those due entirely to so-called "carelessness" and incurred on a machine or other object than can ordinarily be regarded as perfectly safe. Until recently progress has been made chiefly through the study of the impersonal factor. Questions of safety devices, guards for dangerous machinery, and machine design are continuously being investigated with the object of reducing accident risk to a minimum. Great advance has been made during the last 30 years. Far more attention is paid to the subject of safeguarding by machinery makers, so that a given machine is now often well protected before it reaches the user; indeed, in the case of some machines, formerly dangerous, it is now physically impossible to sustain an accident.

Factors in Accident Causation

Dealing with other factors in accident causation, Mr. Wilson says the provision of good lighting is of paramount importance, especially for occupations involving a high risk. Similarly, a suitable temperature is desirable, particularly the avoidance of unduly low temperatures. Then again, there is the beneficial effect of constant vigilance exercised by some form of safety organisation in a particular works, and the successful establishment of such organisation has nearly always been followed by a reduction in accident frequency.

The Factory Department issues a quarterly serial describing accidents that have actually happened, and the means for their prevention. Much, too, can and has been done by the activities of non-official bodies—the National Safety First Association, the Industrial Welfare Society, and certain large insurance companies—through the display of posters, the preparation of cautionary leaflets and other services. Still more could be done in this direction by instilling a spirit of caution into potential workers, namely, school children, while they are at the most receptive age. It is common for children to be warned against road dangers, and combined with these lessons there might be some directed against industrial risks. In Germany this is the standard practice. And again, new entrants into factories might be taken round the works before starting on their process and shown some of the more obvious risks. In some factories this is already done, and is a simple matter where there is a safety officer available. In other works each new entrant is handed a leaflet explanatory of the dangers ahead.

A Big Decrease in 1932

A big drop in accidents in 1932, compared with 1928, led to the hope that accident risk was beginning to decline. The data for 1934 show that this hope was not justified, for they indicate that the accident rate has again risen, though not to the level of 1928.

Mr. Wilson suggests that the explanation is that as trade depression deepens, the general tendency is to retain the steadiest workers, so that the population then exposed to risk is composed of the less accident-prone workers. Subsequently, when trade revives, the more accident-prone workers are reabsorbed, with the additional handicaps of youth, and, on the part of the older men, loss of practice and possibly lessened physical stamina due to unemployment.

In the second lecture Mr. G. S. Taylor points out that the immediate cause of an injury to a person arising from an accident can usually be ascertained without difficulty; but the primary and subsidiary causes are often ascertainable only by careful and skilled inquiry, and even this may fail to reveal the relative importance of the various factors both personal and impersonal. Fatigue and speed of production are two personal factors influencing accident causation. Fatigue is not an important contributing factor when normal hours are worked, but is manifested by a high accident incidence if long hours are worked for considerable periods. Speed of production apparently plays a greater part in accident causation than fatigue. This may be due to speed increasing the exposure to a particular danger point, and one authority considers that increased speed may upset the worker's rhythm and so make his co-ordinated actions less accurate. Speed of production may be influenced by piece work and bonus systems of payment, and sometimes managers and foremen try to influence it by exercising undue pressure on the workers. These methods have a tendency in some circumstances to make workers take unnecessary risks.

Want of Experience

Want of experience in connection with industrial plant and process is a factor in accident causation which affects both young persons and adults, although in the case of the former it may be coupled with recklessness and daring. Investigation of a number of accidents to young persons has revealed that many of these are due to: (i) lack of proper instruction and training; more especially in connection with the dangers of machines and processes, and (ii) want of proper supervision.

Examination of the accident records in many factories of various kinds has shown that certain persons do suffer from accidents much more frequently than others. In some cases firms have transferred such persons to other classes of work, but sometimes only after they have sustained serious injury. If tests for accident proneness had been carried out and acted

* Copies may be obtained from the Royal Society of Arts, 18 John Street, Adelphi, W.C.2, price 2s. 6d. per copy.

upon, these persons might have been transferred before they sustained serious injury.

Reviewing the various causes of accidents, Mr. Taylor says there has been a considerable increase in the use of power presses not only in the various metal industries, but also in the making of articles from various sheet materials, bakelite and similar compositions. Hence, in spite of the fact that effective guards have been devised for the tools of presses there has been an increase in the number of accidents on these machines, and 538, including one fatality, were reported in 1933. Practically the whole of these accidents were due to crushing of the fingers or hands of the operators between the tools or dies of the presses whilst they were either inserting or removing the article or material under operation. The principal causes of press accidents are: (i) failure to provide or maintain an efficient guard for the tools; (ii) use of a guard which is unsuitable for the press or for the particular operation; (iii) wrong methods of feeding; (iv) employment of young or inexperienced persons without proper training or supervision. Many of those responsible for power press operations have failed to study the best methods of feeding, guarding and lighting these dangerous tools and also of selecting and training operators for them.

Transport Accidents

Some form of transport for material and goods is used in every industry. In the heavy industries steam locomotives and wagons are used in addition to travelling cranes and other mechanical means of transport, whilst in other industries petrol, petrol electric and electrically-operated trucks are rapidly superseding man-handled trucks and barrows. During 1933 these forms of transport gave rise to 36 fatal and 1,641 non-fatal accidents. The industries responsible for the largest number of accidents were metal extracting and conversion, engineering, clay stone and cement, and docks. The majority of the fatal and serious accidents occur in connection with the use of locomotives, and the principal causes are: (i) workers being trapped through wagons being moved whilst they are crossing between or under them instead of going round the end of the set; (ii) shunters riding on coupling pole placed under wagon frames or riding on buffers or other parts without adequate foothold or handhold; (iii) crushing between the wagons when coupling by hand instead of using coupling pole; (iv) shunter not walking beside the front of moving wagon when sets of wagons are being pushed by a locomotive, and hence not being in a position to see persons who are endangered; (v) engine driver not sounding whistle, thus giving warning of approach at crossings, etc; (vi) unauthorised interference with brakes of wagons, particularly when these are standing on an incline. A certain number of accidents also arise through defective structural conditions or lay-out of the works; thus persons are trapped through the railway track being carried too close to a fixed structure or through material being stacked too close to the track. Workers are also injured through defective rails causing overturning of locomotives or wagons, and in some cases by being run over when a foot has been accidentally trapped in the rails.

The Risk of Explosions

Explosions of various kinds accounted for 17 fatal and 744 non-fatal accidents in 1933. These cases were distributed over all the principal industries, but the largest number occurred in the heavy metal and engineering trades. The chemical industry also accounted for considerable proportion. Explosions in factories are due to a wide variety of causes, but are of two main types: (i) those due to pressure of gas or vapour such as air or steam being suddenly released through failure of the containing vessel; and (ii) those due to the ignition of a solid, liquid or gas under such conditions that the products of combustion set up a considerable pressure. Explosions of steam boilers and steam plant are now comparatively rare, thanks to the provisions of the Boiler Explosions, Factory and Mines Acts.

The majority of accidents caused by explosions of steam plant arise from such vessels as steam-jacketed pans used in confectionery and other food industries, and drying cylinders used in the textile and paper-making industries. The principal causes of these explosions are: (i) failure to maintain vessels and their fittings in good condition, and (ii) the absence of proper arrangements for reducing the steam pressure to a safe limit for the vessel and for maintaining it below this limit. Compressed air and other compressed gases have also given rise to a number of explosions. The majority of explosions of air compressors and receivers are due to structural weakness, either through the use of old and worn boilers as receivers, or, in the case of small receivers, from failure of welded joints. Explosions due to ignition of combustible matter present in compressed air or oxygen are almost invariably very disastrous. In the case of explosions of parts of compressors and air receivers from this cause, the combustible matter is generally provided by the lubricant, and ignition occurs through overheating of the compressed air rising from a defect in the compressor.

Compressed oxygen should not be allowed to come into contact with fatty matter of any kind, and failure to observe this precaution has resulted in several accidents, for example, in attempting to start Diesel and semi-Diesel engines with compressed oxygen instead of compressed air, or by using a pressure gauge which has been in contact with oil in connection with this gas.

Dust Explosions in Factories

A certain number of accidents occur every year through dust explosions in factories. Most combustible solids, *e.g.*, coal, flour, wood, will give rise to an explosion if they are ignited when in the form of a dust cloud suspended in air. Many of the disastrous explosions which occur in coal mines are due to the ignition of the coal dust. A dust explosion is very similar to a gas explosion, but its effect in a factory is different from that in a mine—a factory building is not constructed to stand sudden internal pressures, so that a comparatively small pressure may cause the walls to collapse outwardly with consequent wrecking of the building. The most disastrous factory accident which has ever occurred in this country was due to an explosion of cattle cake dust at a mill in Liverpool some years ago. In that case 39 persons, including a number of the general public, were killed.

Aluminium and magnesium powders, in addition to the dusts of carbonaceous materials, give rise to serious explosions. Both these metals combine with oxygen with great evolution of heat, so that when ignited in the form of a dust cloud a rapid expansion of the air occurs, which sets up an explosive pressure. Large quantities of inflammable gases are now used in industry, and explosions in connection with such gases are rather numerous. Explosions of hydrogen usually occur in places where its presence is unsuspected by workers, such as tanks and drums which have contained acid or other materials likely to generate this gas under certain conditions, ignition being produced by a naked light in use for examination purposes, or by a spark accidentally struck by a tool.

Explosions in connection with spraying plants for cellulose lacquers have mostly been due to ignitions of vapours of petrol, benzol and other liquids used as solvents. The ignitions in such cases have been produced by: (i) sparking from unenclosed electrical plant; (ii) sparking from metal articles, *e.g.*, wire or a bolt, coming in contact with a revolving fan; and (iii) ignition of deposits of cellulose on fans or bearings due to overheating of these parts.

The Third Lecture

Dealing with accident prevention, Mr. Leonard Ward points out that so far as hoists are concerned, it must be common knowledge that fully automatic controls to hoist gates are made by every hoist maker of repute, and he cannot suggest to the user of a hoist (whether the hoist be power-driven or hand-operated) any better method of preventing a person falling into the hoist well than the provision of gates which are automatically controlled, so that the cage cannot be moved until all gates are shut, and no gate can be opened until the cage is at that floor level. Overloading is one of the main causes of crane accidents; this may be avoided by the use of an automatic safe load indicator, an appliance which warns the driver when he is approaching the safe load, and gives a further warning immediately the safe load is exceeded, so that the driver may take steps to rectify the overload. Many cranes are not fitted with appliances of this kind.

The safeguarding of operative machinery without interfering with production is often a difficult problem; legally, of course, fencing is required without regard to production, but, notwithstanding this, several methods have been evolved to meet the situation for different types of machines. It is

often alleged that fencing of machines impedes production, but there is ample proof that, with the use of safeguards properly designed, loss of production does not occur. In fact, a well-designed safeguard generally results in increased output, in consequence of the greater security felt by the worker at the machine.

The danger of explosions from inflammable gases is generally recognised, but similar danger from fine carbonaceous dust is by no means common knowledge. The causes of explosions of this class generally are of a simple order; fortunately, preventive measures in both cases are also fairly simple. In the first place, leakage of either gas or dust shopuld be prevented by tight joints in pipes, conveyors or machines where gases or dusts are used. All means of ignition should be carefully isolated. Where small explosions may occur in the process itself, the prevention of secondary and more violent explosions may be effected by the provision of suitable "chokes" introduced in the apparatus or machine and, in order to reduce the damaging effects of explosions when they occur, adequate relief valves or panels should be provided with the discharge carried outside the building. Inflammable dusts should not be allowed to accumulate on walls, ledges, beams, etc. The use of vacuum cleaners is regarded as the best method of removing dust of this kind.

Danger in Repairing Drums

The repair of drums and other vessels which have contained petrol and such like inflammable liquids is highly dangerous unless adequate precautions are taken before the repairs are started. An explanatory leaflet and poster suitable for affixing in workrooms have been issued by the Department, and Mr. Ward urges that, where such work is likely to be undertaken, both these forms should be procured by all employers concerned, and that the suggested precautionary measures should be carefully carried out. Owing to the vast extent to which cellulose lacquers or "dopes" are now used, and in view of the risks involved, especially with the dried residues, a code of regulations was recently put into force.

Gassing accidents are frequently caused by workers being allowed to enter flues, vats, stills, or other vessels before all dangerous gases have been removed. The obvious remedy is to ensure that the flue or containing vessel is properly scavenged to remove all traces of dangerous gas before any person is allowed to enter. It is also advisable that the vessel should be tested for gas before entry. Further, the supply pipes to the vessels should be broken outside the vessel and properly blanked off before repairs are undertaken. The provision of suitable breathing apparatus and life-lines is also a wise precaution, so that, in the event of any person being overcome by gas, means of rescue are immediately at hand.

Protective Coverings

Vessels containing acids and other corrosive substances near or over which persons have to work or pass should, wherever practicable, be completely covered in, failing that, the edges of the containing vessels, platforms and gangways nearby should be properly fenced. Suitable protective clothing, including eye protectors, should be provided for all persons employed at handling such substances.

As a rule there is a point of general interest or a lesson to be learned from most accidents, *e.g.*, an accident may give point to a danger which may arise in certain circumstances at a particular part of a machine, or in a particular operation or method of working, or it may stress the necessity for the more intensive training of young workers, or give emphasis to the indifference to danger often shown by even highly skilled workers. Too frequently, however, the circumstances of an accident (although they may arise with like consequences in many other works) are known only to quite few persons—maybe the works manager, the injured person and the factory inspector. In order to overcome this, the Chief Inspector decided, about two years ago, to issue a small illustrated booklet in which accounts of actual accidents should be given, so that the educative aspect of these occurrences would be available on a much wider basis. These abstracts are published quarterly by H.M. Stationery Office, and the price (3d. per volume) has purposely been kept low.

New Technical Books

ORGANIC SYNTHESES. Editor-in-Chief, Carl R. Noller. pp. 104. Chapman and Hall. 8s. 6d. net.

This is volume XV of an annual publication, dealing with the most satisfactory methods for the preparation of organic chemicals.

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ELECTRIC FURNACES: PROGRESS OF CHEMICAL APPARATUS, PART 4 (Elektrische Ofen, Fortschritte des chemischen Apparatewesens, Lieferung 4). By Adolf Bräuer and Josef Reitstötter. Leipzig: Akademische Verlagsgesellschaft m.b.H. RM. 28.

Part 4, so excellent in itself, is a worthy continuation of the first three serial parts of that splendid monograph and great work, "Electric Furnaces." This volume can be not only most warmly recommended, but the following parts must be awaited with special interest, for they will deal primarily with "chemical technique."

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THE FUNDAMENTALS OF CHEMICAL THERMODYNAMICS. PART I. ELEMENTARY THEORY AND ELECTROCHEMISTRY. By J. A. V. Butler, D.Sc. pp. 53. Macmillans. 7s. 6d. net.

The importance of the thermodynamical method in chemistry is now widely realised, but until now the beginner has not been catered for. Mr. Butler's book gives an excellent elementary introduction to the subject, which stresses the underlying principles and at the same time gives due attention to their applications. The author has presented his material in a logically precise, yet simple, form, having in mind not only the student who intends to specialise in physical chemistry, but also that class of chemistry students which has only a very moderate knowledge of mathematics. This part of the work, containing the "elementary theory," is based mainly on cyclic processes. A second part is in preparation, which will deal with the more advanced parts of the subject, mainly on the basis of "thermodynamical functions."

THE CHEMICAL FORMULARY. Edited by H. Bennett. pp. 1,156. Chapman and Hall, Ltd. 2 vols. 25s. net each vol.

This book, which is the product of the brains of a large number of experts, contains a mine of really useful information. It aims at presenting in a concise manner the whole field of commercial and industrial preparations, and while intended primarily for the expert, it is intelligible to the layman. It is seldom that any formula will give the exact results required, but formulae are very useful starting points for tackling specific problems. Most commercial preparations are not synthetic or definite chemical compounds, but are mixtures or highly complex blends. Literature in this field is both meagre and antiquated, and Mr. Bennett's work should prove a real blessing to industrial and commercial chemists.

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MINING AND ORE-DRESSING TECHNIQUE (Berg-und Aufbereitungstechnik). By Dipl.-Ing. H. Madel and Dr.-Ing. A. Ohnesorge. (Vol. 1: Technical Foundations of Work in the Open—Technische Grundlagen des Tagebaues; Part 1, Production—Gewinnung; Part 2, Hauling and Tipping—Förderung und Verkippung.) Halle a/S: Wilhelm Knapp.

Only a few inorganic raw materials can be produced as comparatively easily as nitrogen from the air. Almost all other inorganic materials have to be produced from the earth, some brought to the surface from great depths of the earth. Hence the importance of this book for all industries which use inorganic raw materials, *i.e.*, all industries of modern technique. The authors, Madel and Ohnesorge, give their very extensive work the sub-title "Principles for the Layout of Mining and Ore-Dressing Plants, including Plants in the Stones and Earths Industries." Volume I on "Technical Foundations of Work in the Open" is sub-divided into two separate books—Part 1 describes "Production" and Part 2 "Hauling and Tipping." The guiding idea in the arranging of the work was to give to the mining engineer in his practice

as well as to the student a handbook from which he can become acquainted with the most important elements in converting an organisation or in planning a new plant. The authors therefore deal with theoretical principles of a general kind. They and their collaborators have succeeded so remarkably that the present, and now complete, first volume must be interesting not only for the mining engineer and the student for whom the book was originally intended, but for every technical man who obtains his inorganic raw materials from the earth or the depths of the earth.

* * *

TECHNICAL AND SCIENTIFIC ENCYCLOPAEDIA Edited by C. F. Tweney and I. P. Shirsov, A.M.I.E.E. Hutchinson and Co. 3 vols. 28s. net each vol.

This work has been termed an encyclopædia because of the alphabetical arrangement of the subjects dealt with, but the treatment of each subject and the great amount of data, formulæ and tables make it an ideal hand-book of practical information for everyday use. On many subjects the articles run almost to book length, and where necessary they have been fully illustrated. Terms and apparatus incidental to the various sciences, industries and trades have been aptly defined and described. Data, processes and terms in pure and applied science, construction and engineering, the principal manufacturing industries and the skilled trades are also fully explained. Also in order to assist those who may desire to refer to additional sources of information the editors have compiled a bibliography at the end of the volume in which all books and papers relating to the subjects dealt with are listed under the various subject headings.

* * *

THE DISCOVERY OF SPECIFIC AND LATENT HEATS. By Douglas McKie, Ph.D., B.Sc., and N. H. de V. Heathcote, B.Sc. pp. 155. Edward Arnold and Co. 6s. net.

The subject with which this book deals, under its unpretentious title, is no less than the foundation of the modern science of heat, which may be said to have originated when a really clear distinction was made between heat and temperature. The importance of Black's work has always been recognised, but considerable obscurity has surrounded the services of his predecessors and contemporaries, notably Wilke, in establishing the science. Robison, writing shortly after Black's death, did not scruple to suggest that the northern man of science had derived his work from a surreptitious knowledge of what Black had done. In this book the reader will find a very careful and objective discussion of his achievements of the Baltic workers, which appears to establish, among other things, that, while Wilke's work was independent, there is no doubt that it was both later and less satisfactory than that of Black. The book owes much of its existence to the fact that throughout it is based on a study of the work of the original writers.

Personal Notes

MR. THOMAS HADFIELD, chairman and managing director of J. J. Hadfield, Ltd., bleachers and dyers, of Birch Vale and Chinley, left estate of the value of £80,467, with a net personalty £74,961.

MR. WM. BEDDOWS, J.P., principal of the Dukinfield Bleaching Co.'s works, at Dukinfield, left estate valued at £64,257, with net personalty £60,219. Mr. Bellows, who died in June, aged 78 years, was a bachelor, and a native of Radcliffe, where he was in business as a drysalter and manufacturing chemist. He resided at "Thorneycroft," Lytham Road, Squires Gate, Blackpool, and was one of the oldest magistrates for Blackpool.

MR. K. S. MURRAY, who died in Scotland on August 8, was a very fine engineer and a famous industrial personality. He was a great figure in the oxygen industry—so great as to be synonymous with it. In 1886 he joined the Brin Oxygen Co., and by his patents he made a financial success of the process of manufacturing commercial oxygen from barium oxide. After this achievement he set up oxygen plants in France, Germany, and the United States. In 1906 he recognised the importance of the Karl von Linde method of oxygen production by the liquefaction of air, and he installed the Linde system in all his factories. At the time of his death Mr. Murray was honorary governor of the British Oxygen Co., an appointment conferred upon him on his retirement in 1933.

MR. ALFRED WALTER BUSH, whose death was recorded last week, was for many years one of the most prominent figures in the essential oil trade. A son of the late W. J. Bush, who founded the business bearing this name, he started his career with a firm of colonial merchants, Green and Pitt, after which he proceeded to Sicily where he made a practical study of the citrus oil industry. Upon the death of his father in 1889 he was recalled to London and subsequently participated in the formation of W. J. Bush and Co., into a limited liability company, of which he was a managing director from its inception in 1887 until his death. Mr. Bush was to be seen regularly on 'Change for over 40 years. He was a believer in personal contact with those with whom he had business dealings, and in consequence developed a wide circle of business friends who came to esteem him for his straight dealing, sense of justice, kindness and cheerful humour. For those qualities he was equally esteemed by his colleagues and the staff of his firm.

MR. OLIVER C. RALSTON, of Clarkdale, Arizona, has been appointed supervising chemical engineer of the Nonmetallic Minerals Experiment Station of the Bureau of Mines, Department of the Interior, at New Brunswick, N.J. Mr. Ralston succeeds Dr. E. P. Partridge, who resigned to enter private employment. Mr. Ralston entered the service of the Bureau of Mines in 1912. When the United States entered the war, he resigned to engage in technical supervision of the manufacture of munitions at Niagara Falls. After the war, Mr. Ralston returned to the Bureau of Mines, where he remained for eight years, acting for some time as supervising engineer of the Pacific Experiment Station, Berkeley, California. For the past seven years, he has been director of research for the United Verde Co., at Clarkdale. Mr. Ralston was born in Colorado Springs, Colo., on September 6, 1887. He was assayer, chemist and teacher of chemistry at Leadville, Colo., from 1910 to 1912; chemist, United States Bureau of Mines, Pittsburgh, 1912-1914; metallurgist, Salt Lake City, Utah, 1914-17; metallurgist, Hooker Electrochemical Co., Niagara Falls, 1917-20; and assistant chief metallurgist, U.S. Bureau of Mines, 1920-28. Mr. Ralston is the author of a number of technical books and articles.

Oil Burning Equipment

A Standard Specification

THE British Oil Burner Manufacturers' Association, which was formed some eighteen months ago to provide a central organisation for manufacturing firms of liquid fuel burning plant has, during its first year, been engaged in the preparation of a standard of design, manufacture and installation of automatic oil burning equipment for central heating and hot water supply. This has been approved by the Association. It is generally in accordance with the recommendations in connection with liquid fuel issued by the fire offices committee and it is understood to comply in the main with the requirements of the London County Council.

Attached to the specification is a list of the ordinary members of the Association and of the associate members, the latter being mainly suppliers of auxiliary equipment which forms part of the complete installation. The specification has now been brought to the notice of a number of Government departments and various professional and other bodies, including the Royal Institute of British Architects, the Association of Consulting Engineers, the Institution of Heating and Ventilating Engineers and the Chartered Surveyors Institution, in the hope that they will recognise it and recommend its adoption by their members as a basis for tender.

It has long been felt that such a standard was desirable and it is hoped that it will prove of benefit both to members of the Association and to those who use their products.

British Overseas Chemical Trade in July

Large Increase in Exports

ACCORDING to the Board of Trade returns for the month ended July 31, exports of chemicals, drugs, dyes and colours were valued at £1,715,252 as compared with £1,552,315 for July, 1934, an increase of £162,937. Imports were valued at £920,896, as compared with £909,306; re-exports were valued at £50,022.

Imports

	Quantities. July 31, 1934.	Quantities. July 31, 1935.	Value. July 31, 1934. £	Value. July 31, 1935. £
Acids—				
Acetic .. .. cwt.	17,282	12,336	29,016	17,457
Boric (boracic) .. ,,	1,520	1,660	1,562	1,573
Citric .. .. ,,	900	1,349	2,554	5,459
Tartaric .. ,,	3,805	5,687	16,117	23,974
All other sorts .. value	—	—	9,793	12,352
Borax .. .. cwt.	12,105	17,307	6,320	8,948
Calcium carbide .. ,,	72,497	90,655	39,068	46,689
Phosphorus .. ,,	3,256	2,526	10,275	6,849
Potassium compounds—				
Caustic and lyes cwt.	11,950	13,386	12,763	16,219
Chloride (muriate) ,,	23,454	47,042	9,634	15,673
Kainit and other mineral potassium fertiliser salts .. cwt.	12,400	23,900	3,777	4,056
Nitrate (saltpetre) ,,	1,818	17,988	2,023	10,661
Sulphate .. ,,	15,042	14,640	6,571	5,561
All other compounds ,,	10,479	9,575	16,967	14,076
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	10,066	124	3,042	42
Chromate and bichromate .. .. cwt.	4,874	2,400	7,034	3,416
Cyanide .. ,,	1,646	2,000	3,759	4,989
Nitrate .. .. ,,	500	15,910	106	3,604
All other compounds ,,	13,513	22,649	13,831	13,973
Other chemical manufactures .. .. value	—	—	195,156	246,437
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	47,432	103,616	4,437	7,950
Medicinal oils .. cwt.	1,115	4,058	2,250	10,542
Ointments and liniments cwt.	8	8	690	852
Proprietary medicines value	—	—	38,867	32,125
All other sorts manufactured or prepared value	—	—	51,381	46,353
Bark Cinchona (bark Peruvian, etc.) cwt.	1,314	781	5,472	3,462
All other sorts raw or simple prepared value	—	—	27,867	31,261
Dyes, dyestuffs, and extracts for tanning—				
Finished dyestuffs (coal tar) .. .. cwt.	4,050	3,509	116,973	95,015
Extracts for dyeing ,,	5,146	4,541	14,867	11,935
Chestnut extract ,,	23,724	28,102	16,055	19,379
Quebracho extract ,,	32,243	36,365	19,716	21,878
All other extracts for tanning .. cwt.	24,311	23,657	15,960	16,367
All other dyes and dyestuffs .. .. cwt.	1,045	986	27,293	17,622
Painters' colours and materials—				
White lead (basic carbonate .. .. cwt.	7,962	7,482	9,366	8,729
Lithopone .. ,,	19,962	17,035	13,215	10,911
Ochres and earth colours cwt.	20,225	47,506	8,659	15,265
Bronze powders ,,	1,783	1,827	11,949	12,704
Carbon blacks .. ,,	58,247	38,107	87,921	56,813
Other pigments and extenders, dry .. cwt.	31,950	34,640	8,862	9,790
All other descriptions ,,	20,180	14,659	38,138	29,935
Total .. .. value	—	—	909,306	920,896

Exports

Acids—				
Citric .. .. cwt.	3,668	3,367	12,423	13,640
All other sorts .. value	—	—	19,140	18,722
Aluminium compounds tons	3,010	6,594	23,327	69,666
Ammonium compounds—				
Sulphate .. ,,	19,854	28,371	113,910	176,124
All other sorts .. ,,	752	3,432	11,993	35,312
Bleaching powder (chloride of lime) .. .. cwt.	47,423	51,108	13,622	13,297
Coal tar products—				
Cresylic acid .. gal.	161,328	116,400	13,856	10,371
Tar oil, creosote oil, anthracene oil, etc. gal.	1,605,007	1,662,121	30,916	43,120
All other sorts .. value	—	—	14,535	13,009
Copper, sulphate of tons	2,398	1,663	33,183	23,042
Disinfectants, insecticides, etc. .. .. cwt.	28,982	26,205	67,518	61,933
Glycerine .. .. ,,	13,545	10,141	28,103	24,240
Lead compounds .. ,,	12,518	11,637	15,107	14,023
Magnesium compounds tons	418	482	9,891	10,839
Potassium compounds cwt.	7,985	8,095	14,855	11,714
Salt (sodium chloride) tons	28,136	16,856	73,346	48,888
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	357,013	384,717	89,265	91,194
Caustic .. .. ,,	150,149	184,556	88,263	97,315
Nitrate .. .. ,,	12,015	18,046	4,282	5,933
Sulphate, including salt-cake .. cwt.	87,563	70,222	7,083	5,884
All other sorts .. ,,	65,651	63,996	77,636	77,549
Zinc oxide .. tons	1,178	903	22,425	16,269
All other descriptions value	—	—	204,660	190,837
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	106,607	135,751	10,926	12,925
Proprietary medicines value	—	—	73,533	107,085
All other descriptions ,,	—	—	129,399	136,016
Dyes, dyestuffs and extracts for tanning—				
Alizarine, alizarine red and indigo (synthetic) cwt.	797	2,852	4,391	14,746
Other finished dyestuffs (coal tar) .. cwt.	5,274	5,380	71,260	76,849
All other descriptions ,,	16,782	21,497	23,441	26,498
Painters' colours and materials—				
Ochres and earth colours cwt.	19,477	16,144	17,794	16,994
Other pigments and extenders, dry .. cwt.	19,629	18,035	25,345	27,981
White lead .. ,,	5,901	6,173	11,038	12,292
Paints and painters' enamels, prepared .. cwt.	36,756	41,763	100,759	106,786
Varnish and lacquer gal.	67,961	76,744	30,003	31,585
All other descriptions cwt.	30,894	35,631	65,087	72,574
Total .. .. value	—	—	1,552,315	1,715,252

Re-Exports

Chemical manufactures and products .. value	—	—	15,379	20,199
Drugs, medicines, etc.—				
Manufactured or prepared .. .. value	—	—	11,150	10,246
Raw or simply prepared value	—	—	7,766	13,157
Dyes and dyestuffs and extracts for tanning cwt.	785	727	1,356	4,448
Painters' colours and materials .. .. cwt.	670	1,029	1,302	1,972
Total .. .. value	—	—	36,953	50,022

Continental Chemical Notes

Belgium

A SUM OF ONE MILLION FRANCS has been allocated by the State to combat the Colorado beetle with the aid of petroleum.

Turkey

EXPANSION OF AREA UNDER RICINUS CULTIVATION in Southern Anatolia is being encouraged by the State. Installation of an oil expressing plant is also contemplated.

Denmark

AN EXPERIMENTAL PLANT FOR EXTRACTING NICOTINE from Danish tobacco will be started this autumn near Holbaek. A new process will be applied which utilises both the leaves and the waste material.

Germany

BITUMINOUS COAL HYDROGENATION by the process of the I. G. Farbenindustrie will be undertaken by the newly-formed Hydrierwerk Scholven A.-G. (capital 10 million marks). Existing German coal hydrogenation plants in the Ruhr are operated by the Fischer process.

France

THE NITROGEN OF BONE GLUE has been found (W. Schermann, " Bull. Assoc. Chim. Sucr. Distill.," *51*, 504) to be assimilable to a large extent by yeast after hydrolysis with sulphuric acid. After swelling in water for 24 hours, the material is melted, mixed with the acid and the whole boiled and aerated whilst being maintained at a constant volume. Neutralisation to an acid content of 3 gms. per litre is effected with lime prior to filtration. When added to molasses as a nitrogen source in yeast manufacture, this modified glue produces yeasts at least equal in quality to those produced with the aid of ammonium salts. Increased yields are also claimed.

Russia

CAMPHOR EXTRACTED FROM THE ABSINTHE PLANT found in Russia, *Artemisia astrachanica,* is remarkable in exhibiting laevo-rotation, since all previously isolated natural camphors have been found to be dextro-rotatory. The method of extraction is outlined by T. A. Sokolova in "Plast. Massy," Sept.-October, 1934.

A NEW HIGH-MOLECULAR ESTER, xylan diacetate, prepared by acetylating xylan in a sealed tube, yields a yellow transparent film on evaporating its solution in pyridine or chloroform-alcohol mixture. Other xylan derivatives prepared (N. I. Soletchnik in " J. Prikl. Phim.," 1935, No. 6) are the stearate (soluble in benzene, melting at 48° C.), the monooleate (insoluble in organic solvents and charring at 250° C. without fusion) and the benzyl ether (soluble in alcohol—benzene and melting at 158° C.).

Italy

THE MONTECATINI COMPANY proposes to manufacture magnesium metal at Bozen, where a special plant will be installed.

COMPULSORY ALCOHOL ADMIXTURE WITH MOTOR SPIRIT may be introduced with a view to cutting down imports. Plans are reported for a distillery to produce 600,000 hectolitres alcohol during each sugar beet season, this amount to be increased to 1 million hectolitres in 1938. Rice is also being considered as a raw material. Italy produced 412,000 hectolitres anhydrous spirit in 1934.

THE ACTION OF DISINFECTANTS upon varioups types of rayon is reviewed by L. Schioppa in "Ann. Igiene" (44, 698). Corrosive sublimate in 2 per cent. solution does not attack the undyed or dyed fabrics after contact for 30 minutes. On the other hand, exposure to phenol (5 per cent. solution) for an equal period leads to action upon dyed fabrics, the solution becoming slightly coloured. Cuprammonium rayon is less resistant than viscose or acetate. Black or red coloured cuprammonium rayons part with their dye to some extent after immersion for 30 minutes in a 20 per cent. formaldehyde solution.

CARBON PREPARED FROM BAGASSE is reported to possess but poor decolorising efficiency even after attempted activation with zinc chloride, magnesia or sulphuric acid. In the opinion of A. Amati ("Ind. Saccar. Ital.," 27, 549), bagasse would be best utilised as a raw material for cellulose manufacture. A much more promising source of decolorising carbon is reported to be quebracho. After activation with sulphuric acid, the product is superior to animal charcoal in decolorising power while treatment with magnesia yields a material with absorbent properties comparing very favourably with those of norit and carboraffin.

Far Eastern Chemical Notes

Japan

PLANS FOR MAKING RUBBER-LIKE MATERIALS and motor fuel starting from calcium carbide are being developed by the Oriental Nitrogen Industry Co. (Toyo Chisso Kogyo K.K.).

A CARBAZOLE PLANT with an annual output capacity of 100 tons is under construction by the Japanese Steelworks Company (Nippon Seitetsu K.K.) at a cost of 100,000 yen.

China

THE VITAMIN C CONTENT of the leaves of the Chinese iris is reported by Chi and Read to range from 0.02 to 1.1 mg. per gm. ("J. Chinese Chem. Soc.," 2, 271).

THE FERTILISER FACTORY built in Kwantung some little time back is now making 6 distinct types of fertiliser catering for different branches of the grain, vegetable and fruit growing industries.

THE MINISTRY OF INDUSTRY is considering erection of a factory for making motor tyre and other rubber products. Road surface improvements and newly-constructed highways have led to a considerable increase in demand for tyres, importh of which during 1934 are valued at 5 million taels.

A NEW CRYSTALLINE ALCOHOL OF HIGH MOLECULAR WEIGHT, perrilol, has been isolated from the leaves of the Chinese perilla plant (*Perilla Nankinensis*) in a yield of 0.14 per cent. It melts at 271° C. and crystallises in colourless needles. ("J. Chinese Chem. Soc.," 3, 315).

International Nickel Company of Canada

Quarterly Statement indicates Increased Consumption of Nickel

A NET profit of $5,420,615.13, equivalent to 34 cents per share on the common stock after allowing for preferred dividend, is reported for the second quarter of 1935 in the quarterly statement of The International Nickel Company of Canada, Ltd. This compares with a net profit of $4,917,627.24, for the first three months of the current year, which was equal to 30 cents per share on the common. Net profit for the first six months of 1935 was $10,338,242.37, as compared with $10,012,642.39 for the first half of 1934.

A note on the interim statement calls attention to the fact that on June 18, 1935, the company acquired the 10 per cent. minority interest in Ontario Refining Co., Ltd. As that company is now a wholly-owned subsidiary, its accounts have been included in the interim consolidated statement as of June 30. The amount paid for the capital stock of Ontario Refining Co., Ltd., is therefore no longer shown under " investments." The various items of assets and liabilities of the subsidiary company are shown in their proper classifications in the consolidation. A further note on the interim statement shows that the outstanding debentures, £1,060,508, were retired August 1, thus relieving the company of all bonded indebtedness.

In an accompanying letter to shareholders, Mr. Robert C. Stanley, the president, points out that industrial uses for nickel have increased to such an extent that the amount of nickel consumed by peacetime industries to-day is far greater than the volume that has ever gone into war activities.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no changes to report in the general market prices of chemical products this week. Unless otherwise stated the prices quoted below cover fair quantities net and naked at sellers' works.

LONDON.—Chemical markets continue to receive an increasing volume of business and prices in practically all sections are firm and unchanged. In the coal tar products market there has been no change during the week.

MANCHESTER.—No more than a relatively quiet business in both heavy and light materials has been reported on the Manchester chemical market during the past week and there is still much evidence of seasonal influences at work. Contract business of any importance has been rather scarce and traders state that the bulk of the transactions this week has been for comparatively near delivery dates. Specifications are below normal both in respect of the number and the quantities concerned, although the tendency is towards a gradual improvement. Prices are mostly firm and only slight changes have taken place. Among the by-products, however, an easier tendency has developed this week in the case of pitch, crude tar and carbolic crystals, and with one or two exceptions there has not been much trading activity.

SCOTLAND.—There has been a steady day-to-day demand for chemicals for home trade during the week, and rather more inquiry for export. Prices generally continue steady at about previous figures with only slight changes to report.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals, £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—IONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 to £23, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 to £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 10s.; brown, £32.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—LONDON: 30%, £16 to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—6¾d. to 7¼d. per lb. to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £37.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £37 10s.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10¼d. MANCHESTER: B.P., 11¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 10s. per ton. LONDON: £22. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net

d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3⅜d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 2s. 6d. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.

ZINC CHLORIDE.—*Scotland*: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £12 10s.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

CHARCOAL.—£5 to £10 per ton.

METHYL ACETONE.—46-50%, £43 to £47 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.

WOOD TAR.—£2 to £4 per ton.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 6¾d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s . 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 33s. to 35s. per ton. LONDON: 35s. per ton, f.o.b. East Coast port. MANCHESTER: 32s. 6d. f.o.b. East Coast.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality basis 20.6% nitrogen £7 5s. per ton, less 10s. 6d. per ton for August delivery. This price of £6 14s. 6d. delivered to farmer's nearest station in 6-ton lots is the same price as for August, 1934. For delivery later than August no prices have yet been announced.

CALCIUM CYANAMIDE.—For August delivery £6 15s. per ton delivered in 4-ton lots to farmer's nearest station.

NITRO-CHALK.—The price for the new season has been announced at £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for this product for the 1935/36 season has been announced at £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE AND NITROGEN PHOSPHATE FERTILISERS.—Up to the present no prices have been announced for the year 1935/36 and the June prices remain in force for prompt delivery.

Latest Oil Prices

LONDON, Aug. 21.—LINSEED OIL was firmer. Spot, £24 15s. per ton (small quantities). Sept. and Sept.-Dec., £22 7s. 6d.; Jan.-April, £22 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), Aug.-Sept. shipment, £18 7s. 6d. per ton. RAPE OIL was steady. Crude extracted, £31 per ton; technical refined, £32 10s., naked, ex wharf. COTTON OIL was firm. Egyptian crude, £24; refined common edible, £27 10s.; and deodorised, £29 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was quiet. American spot, 43s. 9d. per cwt.

HULL.—LINSEED OIL.—Spot quoted £23 per ton; Aug. £22 7s. 6d.; Sept-Dec., £22 10s.; Jan.-April, £22 12s. 6d. COTTON OIL, Egyptian, crude, spot, £24 per ton; edible, refined, spot, £27; technical spot, £27; deodorised, £29, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £18 10s. per ton naked. GROUNDNUT OIL.—Extracted, spot, £31 per ton; deodorised, £34. RAPE OIL.—Extracted, spot, £30 per ton; refined, £31 10s. SOYA OIL.—Extracted, spot, £22 10s. per ton; deodorised, £25 10s. CASTOR OIL.—Pharmaceutical, 42s. per cwt.; first, 37s.; second, 34s. COD OIL.—F.o.r. or f.a.s., 25s. per cwt., in barrels. TURPENTINE.—American, spot, 45s. 9d. per cwt.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	August 20.	August 13.
Anglo-Iranian Oil Co., Ltd. Ord.	63/9	68/1½
,, 8% Cum. Pref.	36/6	36/9
,, 9% Cum. Pref.	37/9	38/3
Associated Dyers and Cleaners, Ltd. Ord.	**1/10½**	**1/10½**
,, 6½% Cum. Pref.	5/-	5/-
Associated Portland Cement Manufacturers, Ltd. Ord.	57/-	59/-
,, 5½% Cum. Pref.	27/6	27/6
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	66/9	66/3
Bleachers' Association, Ltd. Ord.	6/7½	5/6
,, 5½% Cum. Pref.	11/3	9/4½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	21/3	21/3
Boots Pure Drug Co., Ltd. Ord. (5/-)	50/3	50/3
Borax Consolidated, Ltd. Pfd. Ord. (£)	97/6	95/-
,, Defd. Ord.	16/10½	17/-
,, 5½% Cum. Pref. (£10)	£11/5/-	£11/2/6
,, **4½% Deb. (1st Mort.) Red.** (£100)	£109	£109
,, **4½% 2nd Mort. Deb. Red.** (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	10/-	9/4½
,, 5% Cum. Pref.	13/1½	11/10½
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£86/10/-
British Celanese, Ltd. 7% 1st Cum. Pref.	25/9	26/6
,, 7½% Part. 2nd Cum. Pref.	21/3	24/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/6	5/-
,, **4% 1st Mort. Deb. Red.** (£100)	£91	£91
British Cyanides Co., Ltd. Ord. (2/-)	3/3	3/3
British Drug Houses, Ltd. Ord.	20/-	20/-
,, **5% Cum. Pref.**	22/6	22/6
British Glues and Chemicals, Ltd. Ord. (4/-)	6/-	6/-
,, 8% Pref. (Cum. and Part.)	29/4½	29/4½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/1½
,, **5½% Cum. Pref.**	26/3	26/3
,, **4½% First Mort. Deb. Red.** (£100)	£107/10/-	£107
British Oxygen Co., Ltd. Ord.	110/-	117/6
,, **6½% Cum. Pref.**	31/10½	31/10½
British Portland Cement Manufacturers, Ltd. Ord.	92/6	95/-
,, 6% Cum. Pref.	30/-	30/6
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3
,, **7% Cum. Pref.**	27/6	27/6
,, **6% 1st Mort. Deb. Red.** (£100)	£105/10/-	£105/10/
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	110/-	110/-
,, **4% 1st Mort. Deb. Red.** (£100)	£96/10/-	£96/10/
Calico Printers' Association, Ltd. Ord.	11/3	10/7½
,, 5% Pref. (Cum.)	17/6	16/10½
Cellulose Acetate Silk Co., Ltd. Ord.	11/10½	11/3
,, Deferred (1/-)	2/4½	2/4½
Consett Iron Co., Ltd. Ord.	9/9	9/-
,, 8% Pref.	27/6	28/9
,, **6% First Deb. stock, Red.** (£100)	£107	£105/10/-
Cooper, McDougall & Robertson, Ltd. Ord.	36/3	36/3
,, **7% Cum. Pref.**	30/-	30/-
Courtaulds, Ltd. Ord.	55/7½	59/4½
,, **5% Cum.**	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, **Cum. 6% Pref.**	28/9	28/9
,, **6½% Cum. Pref.**	30/-	30/-
,, 7½% "A" Cum. Pref.	31/10½	31/10½
Distillers Co., Ltd. Ord.	94/-	94/-
,, 6% Pref. Stock Cum.	31/3	31/-
Dorman Long & Co., Ltd. Ord.	21/-	21/-
,, Prefd. Ord.	29/4½	28/9
,, 6½% Non-Cum. 1st Pref.	22/-	23/-
,, 8% Non-Cum. 2nd Pref.	22/-	21/-
,, **4% First Mort. Perp. Deb.** (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£107	£105

Name.	August 20.	August 13.
English Velvet & Cord Dyers' Association, Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	7/6	7/6
,, **4% First Mort. Deb. Red.** (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/1½
,, 7% Non-Cum. Pref.	31/3	31/3
,, **4½% Debs. (Reg.) Red. (£100)**	£106	£106
Gas Light & Coke Co., Ord.	28/1½	28/-
,, 3½% Maximum Stock (£100)	£89/10/-	£89/10/-
,, **4% Consolidated Pref. Stock** (£100)	£109/10/-	£108/10/-
,, **3% Consolidated Deb. Stock,** Irred. (£100)	£92/10/-	£90/10/-
,, 5% Deb. Stock, Red. (£100)	£116/10/-	£116/10/-
,, **4½% Red. Deb. Stock (1960-65)** (£100)	£114/10/-	£114/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	12/6	12/6
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	30/-
Imperial Chemical Industries, Ltd. Ord.	35/3	35/9
,, Deferred (10/-)	8/7½	8/9
,, 7% Cum. Pref.	33/3	33/6
Imperial Smelting Corporation, Ltd. Ord.	14/6	15/3
,, 6½% Pref. (Cum.)	24/1½	24/1½
International Nickel Co. of Canada, Ltd. Cum.	$28½	$28¾
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	95/-	95/-
,, **4% Mort. Deb. Red.** (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	115/-	115/-
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	9/4½	8/1½
,, **7% Non-Cum. Part Pref.** (10/-)	10/-	10/-
Lever Bros. Ltd. 7% Cum. Pref.	31/9	32/-
,, 8% Cum. "A" Pref.	32/6	32/6
,, 20% Cum. Prefd. Ord.	78/1½	78/1½
,, **5% Cons. Deb.** (£100)	£109	£109
,, 4% Cons. Deb. (£100)	£105	£105
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, **6% 2nd Pref.** (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£58	£58
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, **8% Part. Prefd. Ord.** (10/-)	9d.	9d.
,, **7½% Cum. Pref.**	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	42/-	44/-
,, 1st Pref. **6½% Cum.**	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) **7% Gld. Ln.** Sr. "A" and "B" Rd.	£67	£68/10/-
Reckitt & Sons, Ltd. Ord.	115/-	115/-
,, **4½% Cum. 1st Pref.**	25/-	25/-
Salt Union, Ltd. Ord.	45/-	45/-
,, Pref.	46/3	46/3
,, **4½ Deb. (£100)**	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£133/10/-	£129/10/-
,, **6% Irred. Pref. (£100)**	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£108/10/-	£108/10/-
,, Perpetual 3% Deb. (£100)	£89/10/-	£88/10/-
,, 5% Red. Deb. 1950-60 (£100)	£114/10/-	£114/10/-
Staveley Coal & Iron Co., Ltd. Ord.	46/3	46/10½
Stevenson & Howell, Ltd., 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	76/3	78/9
Unilever, Ltd. Ord.	30/-	30/7½
,, 7% Cum. Pref.	29/9	29/3
United Glass Bottle Manufacturers, Ltd. Ord.	42/-	42/6
,, **7½% Cum. Pref.**	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	20/-	21/3
,, 6% Cum. Pref.	23/9	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	7/3	7/3
,, **7% Cum. Pref.**	23/9	23/9
,, **6% Deb. Red.** (£100)	£101	£101

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

RECOVERY OF ALKALI and ammonium phosphates or mixed fertilisers containing the same..—Kali-Forschungs-Anstalt Ges. Feb. 10, 1934. 2099/35.

STABLE LECTHIN EMULSIONS, production.—Dr. E. Asser. Feb. 7, 1934. 2567/35.

COMPRESSION OF GASES, particularly gas mixtures containing acids of nitrogen.—E. I. Du Pont de Nemours & Co. Feb. 9, 1934. 3101/35.

THERAPEUTICALLY-ACTIVE DERIVATIVES of phthalic acid, manufacture.—Chemische fabrik Grünau Landshoff & Meyer. Feb. 9, 1934. 4147/35.

UTILISATION OF COOL GASES.—British Celanese, Ltd. Feb. 8, 1934. 3295/35.

POLYMERISED COMPOUNDS, manufacture.—I. G. Farbenindustrie. Feb. 7, 1934. 3884/35.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Feb. 9, 1934. 4153/35.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Feb. 9, 1934. 4256/35.

DYEING.—I. G. Farbenindustrie. Feb. 10, 1934. 4367/35.

INDIGOID VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. Feb. 10, 1934. 4396/35.

PROMOTING FERMENTATIONS.—K. von Gebstattel. Feb. 10, 1934. 4421/35.

ANTHRIMIDE CARBOZOLE DYESTUFFS, production.—E. I. du Pont de Nemours & Co. Feb. 12, 1934. 4490/35.

WATER SOLUBLE ORGANIC SULPHO COMPOUNDS, manufacture.—Deutsche Hydrierwerke Akt.-Ges. July 20, 1933. 22217/35.

Specifications Accepted with Date of Application

CONDENSATION PRODUCTS, production.—W. Kraus. April 4, 1933. 432,637.

RECOVERING SULPHUR DIOXIDE from refuse sulphuric acid, process and apparatus.—Metallges, A.-G. March 15, 1933. 432,714.

VALUABLE HYDROCARBON OILS by treatment of distillable carbonaceous materials at elevated temperatures and in the presence of catalysts and/or surface-active materials, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 25, 1934. 432,638.

CARRYING OUT OF CHEMICAL REACTIONS with circulating gases. K. Gordon and Imperial Chemical Industries, Ltd. Jan. 30, 1934. 432,574.

KRYPTON AND XENON from atmospheric air, process for manufacture.—Soc. L'Air Liquide, Soc. Anon. Pour L'Etude et L'Exploitation des Procédés G. Claude. Feb. 9, 1933. 432,644.

DYESTUFFS OF THE ANTHRAQUINONE SERIES, manufacture.—I. G. Farbenindustrie. Feb. 1, 1933. 432,647.

CHLORINATED RUBBER in the form of films, manufacture.—J. G. Moore and Imperial Chemical Industries, Ltd. Feb. 2, 1934. 432,803.

SODIUM AND OTHER LIGHT METALS, manufacture.—E. I. du Pont de Nemours and Co. Feb. 2, 1933. 432,810.

WATER-SOLUBLE ORGANIC SILVER COMPOUND, process for the manufacture.—Dr. K. Roth. Feb. 22, 1933. 432,814.

FIREPROOFING AGENTS.—G. Schwedler and Dr. H. Schweitzer. March 20, 1933. 432,819.

AZO DYESTUFFS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 28, 1934. 432,599.

LACQUERS AND PLASTIC MASSES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). June 14, 1934. 432,762.

SEPARATING AMMONIUM CHLORIDE, process.—Soc. D'Etudes Pour la Fabrication et L'Emploi des Engrais Chimiques. Dec. 21, 1933. 432,770.

PROCESS FOR FREEING FROM FAT or oil substances containing fat or oil, such as meat, fish, and fruits.—W. Kelle and F. Carlsson. Sept. 7, 1934. 432,771.

DERRIS ROOT EXTRACTS and other plant extracts, manufacture. Chemische Fabrik Marienfelde Ges. Jan. 18, 1934. 432,626.

PRODUCTION OF COMPOUNDS containing an ethylenic linkage or a polymethine chain.—J. D. Kendall. Dec. 23, 1933. 432,628.

HALOGEN PHENOLS, preparation.—Lehn & Fink, Inc. Oct. 28, 1932. 432,955.

CHLORINATED RUBBER PRODUCTS, manufacture.—K. S. Jackson and Imperial Chemical Industries, Ltd. Dec. 11, 1933. 433,196.

WET PURIFICATION OF GASES.—G. Nonhebel, J. L. Pearson and Imperial Chemical Industries, Ltd. Dec. 28, 1933. 433,039.

HYDROCARBON LIQUIDS, refining treatment.—Anglo-Iranian Oil Co., Ltd., F. B. Thole and S. F. Birch. Jan. 3, 1934. 433,197.

ACENAPHTHENE DERIVATIVES, manufacture.—Imperial Chemical Industries, Ltd., M. Wyler and A. Kershaw. Jan. 5, 1934. 432,885.

AZO DYESTUFFS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Feb. 3, 1934. 433,201.

NITRIC ACID and apparatus therefor, production.—E. I. du Pont de Nemours & Co. Feb. 24, 1933. 432,898.

CHLORINATED PRODUCT.—J. G. Moore and Imperial Chemical Industries, Ltd. Feb. 5, 1934. 432,905.

2-PHENYL-QUINOLINE-4-CARBOXYLIC ACIDS, manufacture of derivatives.—Dr. H. John. November 19, 1933. 433,045.

AQUEOUS SOLUTIONS OF HYDROGEN PEROXIDE, purification.—E. I. du Pont de Nemours & Co. Feb. 6, 1933. 432,915.

5-PYRAZOLONE-DERIVATIVES, manufacture.—I. G. Farbenindustrie. Feb. 8, 1933. 433,053.

COSMETIC PREPARATIONS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Feb. 9, 1934. 433,142.

DYEING OR PRINTING cellulosic fibres, process.—Soc. of Chemical Industry in Basle. Feb. 9, 1933. 433,143.

DYEING OR PRINTING cellulosic fibres, process.—Soc. of Chemical Industry, Basle. Feb. 9, 1933. 433,210.

OXAZINE DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. Feb. 10, 1933. 433,215.

HYDROCARBON LUBRICATING OILS, production.—J. Y. Johnson (I. G. Farbenindustrie). Feb. 28, 1934. 433,061.

HALOGENATED HYDROCARBON COMPOUNDS.—British Thomson-Houston Co., Ltd. April 4, 1933. 433,072.

DYEING ANIMAL FIBRES.—Soc. of Chemical Industry in Basle. April 10, 1933. 433,230.

TREATMENT OF TARS.—Thermal Industrial & Chemical (T.I.C.) Research Co., Ltd. and C. O. Condrup. May 10, 1934. 432,998.

ALKYLAMINES, production.—Boots Pure Drug Co., Ltd., F. L. Pyman and H. H. L. Levene. June 26, 1934. 433,086.

CONDENSATION PRODUCTS CONTAINING NITROGEN, manufacture.—Soc. of Chemical Industry in Basle. July 21, 1933. 433,090.

CHLORINATION PRODUCTS OF CAOUTCHOUC, process for producing.—Thurm & Beschke Kommanditges. Nov. 9, 1933. 433,246.

PRINTING ACETATE ARTIFICIAL SILK, process for.—Soc. of Chemical Industry in Basle. Oct. 21, 1933. 433,106.

TARS.—Lonza Elektrizitatswerke und Chemische Fabriken Akt.-Ges. Oct. 19, 1933. 433,248.

CHLORINATED RUBBER and product thereof, process for producing.—International Latex Processes, Ltd. March 2, 1934. 433,252.

MAGNESIUM HYDROXIDE, production.—I. G. Farbenindustrie. Dec. 23, 1933. 433,253.

CALCIUM CYANAMIDE, disintegration.—Bayerische Stickstoffwerke Akt.-Ges. Dec. 21, 1933. 433,254.

HYDROGENATING GASES of distillable carbonaceous material, treatment with.—R. Holroyd, C. Cockram and Imperial Chemical Industries, Ltd. Jan. 5, 1934. 433,020.

QUININE COMPOUND, process for preparing.—H. P. Kaufmann. Feb. 3, 1934. 433,261.

BUBBLE TOWERS for the production of nitric acid.—E. I. du Pont de Nemours & Co. Feb. 24, 1933. 433,272.

Applications for Patents

(August 1 to 7 inclusive.)

METHODS OF PREVENTING CORROSION by hydrocarbon oils.—G. D. Bengough and L. Whitley. 21921.

PROCESSES FOR OILING LIME-NITROGEN.—R. I. Blackburn (Bayerische Stickstoff-Werke). 22145.

COLLOIDAL DISPERSIONS OF SOLUBLE SILTS.—A. V. Brancker. 22041.

OXYGENATED ORGANIC COMPOUNDS, manufacture.—British Celanese, Ltd., T. P. Dee and W. H. Groombridge. 21992.

CROTYLIDENE CYANACETIC ACID COMPOUNDS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 22082.

N-POLYHYDROXY-ALKYL-PHENYLENEDIAMINES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 22331.

POLYMERISED CARBOXYLIC ACIDS, etc., manufacture.—A. Carpmael (I. G. Farbenindustrie). 22332.

HYDRO-METALLURGICAL SOLUTIONS, treatment.—T. B. Crowe, Merrill Co., and L. D. Mills.

WATER-SOLUBLE ORGANIC SULPHO COMPOUNDS, manufacture.—Deutsche Hydrierwerke. (July 20, '34.) (Germany, July 20, '33.) 22217.

HYDROCYANIC ACID, manufacture.—E. I. du Pont de Nemours and Co. (United States, Aug. 2, '34.) 21861.

MOTOR FUELS, stabilisation.—E. I. du Pont de Nemours and Co. (United States, Aug. 8, '34.) 22348.

RUBBER-LIKE MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. (United States, Aug. 8, '34.) 22349.

DISPERSIONS OF HALOGENOBUTADIENES, production.—E. I. du Pont de Nemours and Co. (United States, Aug. 8, '34.) 22350, 22351.

RESISTS IN DYEING, producing.—Durand and Huguenin. (Germany, Aug. 6, '34.) 21848.

VACUUM DISTILLATION of high boiling point products.—J. Grosjean and P. R. E. Lewkowitsch. 22068.

FIRE-EXTINGUISHING FOAM, manufacture.—W. W. Groves (I. G. Farbenindustrie). 21845.

MORDANT DYESTUFF-SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 21981.

LIQUID POLYMERS of unsaturated hydrocarbons, production.—G. F. Horsley and Imperial Chemical Industries, Ltd. 22220.

AMINO-CARBOXYLIC ACIDS, ETC., manufacture.—I. G. Farbenindustrie). (Germany, Aug. 4, '34.) 22166.

3 : 4 : 5 : 6-HALOGEN-2-AMINO-1-OXYBENZENES, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 24, '34.) 22310.

APPARATUS FOR DECOMPOSING AMMONIA.—Imperial Chemical Industries, Ltd. 22347.

HIGHER BOILING HYDROCARBONS from olefines, production.—International Hydrogenation Patents Co., Ltd. (United States, Aug. 4,'34.) 21802.

REMOVAL OF COPPER from copper-containing solutions of nickel salts.—G. W. Johnson (I. G. Farbenindustrie). 21865.

WASHING, ETC., AGENTS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 21930.

NITROGENOUS CONDENSATION PRODUCTS, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 21931.

PHYDROXYDIBENZANTHRONES and their quinones, manufacture. G. W. Johnson (I. G. Farbenindustrie). 22092.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ROTO LTD., Liverpool, mfrs. of rock salts, etc. (M. 24/8/35.) Reg. August 7, £700 mort., to A. Coughtrie, 2 Woodchurch Road, Birkenhead; charged on land with works at Erasmus Street, and Belmont Street, Collyhurst. *£4,550. Jan. 31, 1935.

W. HAWLEY & SON, LTD., Duffield, colour mfrs. (M., 24/8/35.) Reg. August 12, £1,000 1st deb., to Westminster Bank Ltd.; general charge. *£5,000. Oct. 3, 1934.

Satisfaction

DORMAN LONG & CO., LTD., Middlesbrough, steel mfrs., etc. (M.S., 24/8/35.) Satisfaction reg. Aug. 12, £804 18s. 0d., reg. Dec. 31, 1930.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

A. M. COWEN & CO. (SHREWSBURY), LTD., Klenall Works, Ditherington, drysalters and chemical mfrs. (C.C., 24/8/35.) £30 7s. 8d. July 18.

BROOKES & CO. (firm), 110 Wellington Road, Dudley, manufacturing chemists. (C.C., 24/8/35.) £14 8s. 4d. July 17.

Bankruptcy Proceedings

TAYLOR, Thomas Edward, trading as "North Trading Co.," Market Cross Chambers, Huddersfield, chemical agent. (B.P. 24/8/35).—The first meeting of creditors was held at the Official Receiver's office, Hallfield Chambers, 71 Manningham Lane, Bradford, on August 16. Debtor had prepared a statement of affairs which showed a deficiency of £495. He said his failure was due to insufficient profits to meet overhead expenses of distributing agency, household and personal drawings, ill-health and defalcations by agents.

Company News

John Oakey and Sons.—The payment is announced of 2½ per cent. dividend, less tax, the same as last year.

Wright, Layman and Umney.—A special distribution of 4 1/16 per cent. out of profits realised on the sale of investments is being made. A dividend of 10 per cent. has been paid for each of the past three years.

Tehidy Minerals, Ltd.—An interim dividend of 1¼ per cent., less tax, has been declared, payable on August 31. A similar interim payment was made last year followed by a final distribution of 2½ per cent.

Calico Printers' Association, Ltd.—A net profit of £42,969 is reported for the year ended June 30, against one of £164,872 for the previous year. With the assistance of £100,000 from the general reserve, the dividend on the preference stock will be paid. The last ordinary dividend was that of 5 per cent. for 1928-9.

Solidol Chemical Co.—A net loss is shown in the report for 1934 after charging management, administration and distribution expenses and directors' fees, including special legal expenses, £5,429 (against loss of £9,646 for previous fifteen months). To this is added the debit balance £14,522 brought in, making total debit £19,951 carried forward. The directors state all litigation expense has now been wiped out and company has no outstanding debt.

Lawes' Chemical Manure.—For the year to June 30 last, the report shows trading profit, before fees, etc., and depreciation, £12,329, against £16,281; deduct directors' fees and expenses, £941; reserve for depreciation and renewals £800, surplus on land realisations over valuation prices of September, 1930, have also been transferred to this account; net profit £10,606, against £6,103). The ordinary dividend is 5 per cent., against 2½ per cent., leaving to go forward £2,679. In the previous year there was loss on exchange and reserve against loss on exchange of £8,758.

Paterson Engineering Co.—The report for the year to April 30 last shows profit of £22,487 (compared with £19,704); balance includes £1,632 profit on realisation of investments. After deducting directors' fees, £1,000, contribution to staff fund £726, provision for losses incurred by subsidiary, £4,000 (against £1,056), dividend on preference shares for four months to April 30, 1935, net £1,066, and income-tax, £4,933 (£5,838), there remains £10,763. Adding £4,516 brought in, leaves available £15,279. The dividend of 10 per cent., less tax is the same as last year, and the amount carried forward is £7,529.

Herbert Green and Co.—The first report of the company to June 30 last has now been issued. The accounts show that on valuation of the plant and equipment purchased there is a substantial surplus of £78,882. Part of this surplus has been used to write off the entire preliminary and formation expenses, totalling £42,006. Development and general expenditure totalled £26,522. In July last it was announced that payment of a dividend on the £300,000 7 per cent. cumulative preferred ordinary contemplated for September 30 was deferred, but the question of an interim dividend will be decided as soon as the company has been trading for a sufficient period.

Books Received

Alerte aux Gas! S. de Stackelberg. Lausanne: Librairie Payot & Cie. Pp. 231. Fr. 4.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—An agent established at Melbourne wishes to obtain the representation, on a commission basis, of United Kingdom refiners of lubricating oils of good quality. (Ref. No. 176.)

Canada.—A firm established at Calgary manufacturing and importing chemicals and chemical products wishes to obtain the representation, on a commission or purchasing basis, of United Kingdom manufacturers of chemicals and druggists' sundries, for the Provinces of Alberta and Western Saskatchewan. (Ref. No. 183.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields Directorate is calling for tenders, to be presented in Buenos Aires by September 26, 1935, for the supply of two steam "Duplex" injection pumps, approximately 14 in. by 7¼ in. by 18 in., for a working pressure of 126 atms. (1,800 lbs. per square inch) and a steam pressure of 18 atms. (250 lbs. per square inch). (Ref. T.Y. 5192.)

From Week to Week

ONE MAN WAS KILLED and another seriously injured as the result of an explosion in Belfast last week. Two workmen were engaged in dismantling a gasholder which had lain idle for some months and were on the top of it when the explosion occurred. Both were flung a considerable distance by the force of the explosion.

THE SECRETARY OF THE EUROPEAN PULP CARTEL announces that the members of the Cartel have decided to replace the system of production limitation by a new system of fixed export contingents for each pulp-exporting country belonging to the Cartel. For this purpose, a new meeting of the Cartel will take place in the near future.

A NEW FACTORY for the manufacture of agricultural feeding stuffs is to be built in Glasgow. It will be one of a chain of similar establishments being built throughout Britain by the British Oil and Cake Mills, Ltd., in conjunction with Unilever, Ltd. The firm still intends to continue production at its factory in the north-western area of Glasgow.

THE AIR MINISTRY announces that vacancies will occur next month for over 300 boy entrants, Royal Air Force. Entry is open to boys who were between 15¾ and 17¼ on August 1, 1935, and who have attended a secondary, junior technical or central school up to the age of 15½, or have attained an equivalent educational standard. Intending applicants should write at once for details and application forms to the Air Ministry (Boy Entrants Dept.), Adastral House, Kingsway, London, W.C.2.

AT ITS FOURTEENTH ANNUAL GENERAL MEETING, the Yorkshire Dyeing and Proofing Co., Ltd., reported a satisfactory position. In his speech the chairman, Mr. Isaac Swift, said that it was within the power of the industry of itself to make a substantial contribution towards remedying an unsatisfactory state of affairs, and it was gratifying to him to be able to refer to this and to certain other more comprehensive developments in the industry that were now being worked out, and which, when put into practice, would have an important effect in the stabilisation of prices.

A MEETING OF THE HOLDERS of first preference shares of National Drug and Chemical Co., of Canada, Ltd., will be held at Liverpool, on September 25, to consider a scheme of capital reorganisation. The preference shareholders have voting control. The trustees, Mr. Charles Gane, Lord Elibank and Mr. A. B. Evans, say in a circular: "We decided that it would be necessary to waive the payment of the arrear of dividend on the first preference shares, and that in return for this the voting control of the company and subsequently the control of direction of the company's affairs should pass to the English shareholders."

DISCUSSION OF THE VARIOUS QUESTIONS affecting Imperial trade will be resumed when the British Committee on Empire Trade meets in the autumn. The Committee is composed of representatives of the Association of British Chambers of Commerce, the Federation of British Industries and the Chamber of Shipping, and thus represents the commercial, industrial and shipping interests of the United Kingdom. As the Ottawa Agreements are likely to come up for review in 1937, the British Committee on Empire Trade is taking early steps in order to present to the British Government in due course the considered opinions of the various interests represented.

THE BRITISH STANDARDS INSTITUTION has issued its half-yearly handbook which includes the annual report for 1934-35, presented at the last annual general meeting, as well as the indexed list of current British Standard Specifications. The report on the activities of the three Divisions—Engineering, Building and Chemical—shows the enormous amount of valuable work voluntarily carried out by the Institution's 700 technical committees. Sections showing the current list of B.S. Specifications, and those in course of preparation are followed by a complete subject index. Copies of the new Handbook are available from the British Standards Institution, Publications Department, 28 Victoria Street, London, S.W.1, price 1s. 4d., post free.

JULY HAS PROVIDED a very gratifying recovery of shipments in the china clay industry. In the analysis of the month's returns there were several consignments to the Continent indicating an improvement in the European markets, and three boat loads went to the United States. Unfortunately the American demand for British clay is still retarded by restrictions and competition. The home markets are active and the industry is approaching a yearly average of 800,000 tons. Over 150 boats were provided with work in July at Fowey, Par, and Charlestown, and 5,299 tons were delivered by rail. The details of shipping at the various ports are as follows:—Fowey, 40,859 tons of china clay; 1,681 tons of china stone; 3,314 tons of ball clay. Par, 11,868 tons of china clay; 751 tons of china stone. Charlestown, 4,067 tons of china clay; 633 tons of china stone. Penzance, 583 tons of china clay. Padstow, 499 tons of china clay. Looe, 190 tons of china clay. Plymouth, 117 tons of china clay. Newham, 30 tons of china clay. By rail, 5,299 tons of china clay, making a total of 63,512 tons of china clay; 3,065 tons of china stone; 3,314 tons of ball clay, compared with 51,961 tons of china clay; 3,831 tons of china stone; 2,445 tons of ball clay in June.

THE ALUMINIUM ROAD TANK WAGON for the transport of toluol, illustrated in the special container section of THE CHEMICAL AGE of August 10, has a capacity of 820 gal., not 320 gal., as was erroneously stated beneath the picture.

MANY LEATHER MANUFACTURERS who have not been able to lay up stocks of cod oil, have been compelled to look round for substitutes, *e.g.*, filtered coast cod, whale oil, etc., and the present is a good opportunity to get these tried out.

SHORT AND MASON, LTD., have purchased the business of S. and A. Calderara, previously of Springfield Works, London, manufacturers of mercurial barometers, thermometers, hydrometers, etc., to official and commercial requirements. Mr. A. E. Calderara, the late proprietor, is joining the company, and his plant, equipment, personnel, and technical staff are being merged into the organisation.

EXTENSIONS TO THE WHEELOCK WORKS OF ZAN, LTD., were completed on August 14. The new paint manufacturing plant embodies the latest improvements and operates on gravity-feed principle. The liquid constituents are first blended and then fed by gravity to another machine, in which the powder portions are thoroughly admixed. The final process consists of passing the mixture either through a roller or a cone mill, which grinds it into a fine, smooth paint. The plant was opened by the chairman of the Sandbach Urban Council, Mr. Gordon Booth. The works chemist, Mr. C. Wetherell, gave a description of the plant to visitors.

THE DISSATISFACTION OF THE BRITISH ASSOCIATION OF CHEMISTS with the recommendations of the Poisons Board was brought by Mr. J. J. Cleary, M.P., to the notice of the Home Office, and in reply he has received from the private secretary of the Home Secretary a letter saying:—"The present position is that the statutory period of forty days under the Rules Publication Act having expired, the Home Secretary will proceed carefully to consider the views of the British Association of Chemists, together with other representations that he has received in regard to the rules. I am afraid that it is not possible to say any more at the moment."

A NEW EDITION OF THE CHEMICAL GUIDE BOOK has just been issued by Chemical Markets, Inc., 25 Spruce Street, New York. The book, to which has been added 108 pages (making 803 in all), 153 new chemicals and 160 synonyms is divided into four parts. Part I is a catalogue of all the leading chemical firms arranged alphabetically. Part II contains a buying guide and directory of chemical and allied products with name and address of sources of supply, the chemical and physical characteristics of each product, grades, containers, shipping regulations, tariff, etc. Part III gives a geographical directory of the chemical and allied industries. Part IV is a collection of statistics for the years 1934 and 1935 on approximately 1,580 chemicals.

THE PETROLEUM FIELD OFFICE of the Bureau of Mines, Department of the Interior, at Laramie, Wyoming, is being reopened. The staff will make a general survey of the Rocky Mountain oil fields and refineries to obtain data concerning the problems involved in the development and operation of the fields and in the refining and utilisation of the oil produced in the Rocky Mountain area. Following this general survey, specific problems in petroleum engineering and in refining will be studied. A principal objective will be to obtain data helpful in the refining and use of the Rocky Mountain black oils, which are an important factor in the petroleum industry in that area.

THE GOVERNMENT OF INDIA proposes to pass a law for the control of fertilisers, stabilising their quality. The trade in chemical manures has been increasing rapidly and the Imperial Council of Agricultural Research recently appointed a committee of chemists to report on the need of such an Act and to draft its clauses. Provisions of the proposed Bill require that all scheduled fertilisers should be properly marked, giving the particulars required by the Act. There will also be a definite obligation on the seller to guarantee the composition of the fertiliser. Official samplers and qualified inspectors will be appointed, and the purchasers will have the right to official analysis on payment of fees as in England. In fact most of the provisions are copied from the English Act. The Act will be brought into force in each province when needed.

EXTENSIONS AND MODERNISATIONS OF PLANT estimated to cost £150,000, are to be undertaken by the Mond Nickel Co., Ltd., at Clydach, West Wales. The company has spent hundreds of thousands of pounds in recent years on research with a view to improving production methods and extending the uses of metallic nickel for general industrial requirements. It is also announced that a simultaneous development will take place at the company's collieries at Pontardawe, where it is proposed to open up the lower anthracite seams. A year ago the firm had to give up the manufacture of copper sulphate in the area owing to a restricted market abroad, and a number of men were rendered idle. The demand for nickel pellets has now increased to such an extent, however, that it has been found possible to re engage practically all these men, and others will also be absorbed shortly.

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